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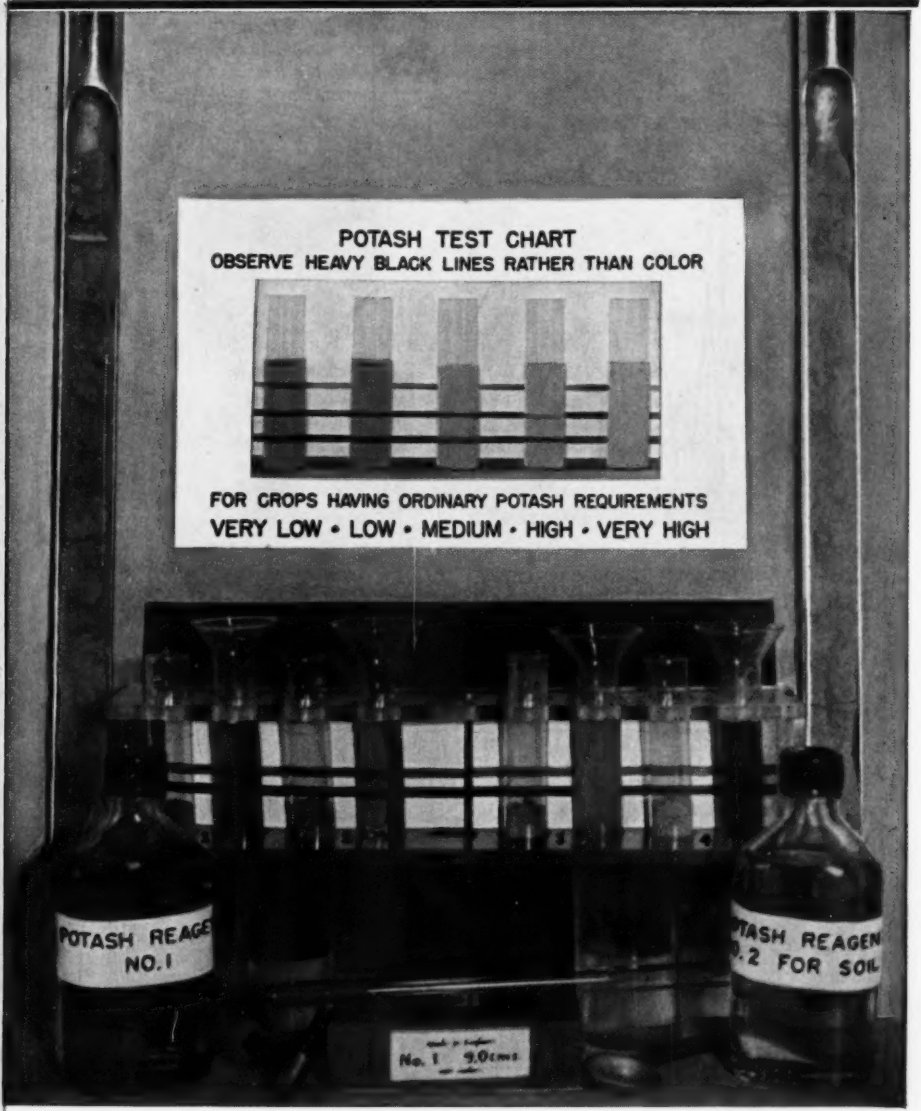
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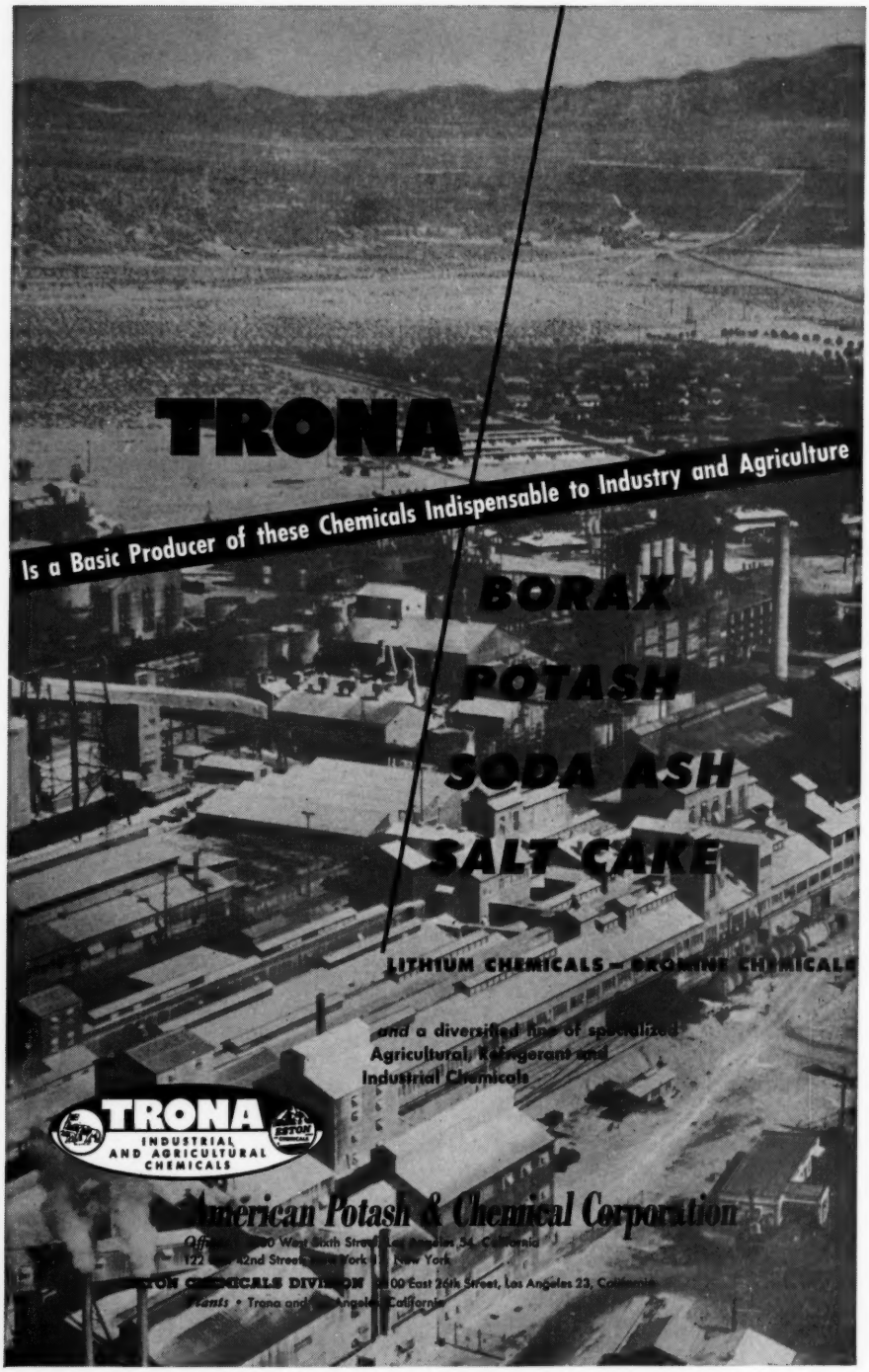
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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXVIII NO. 1

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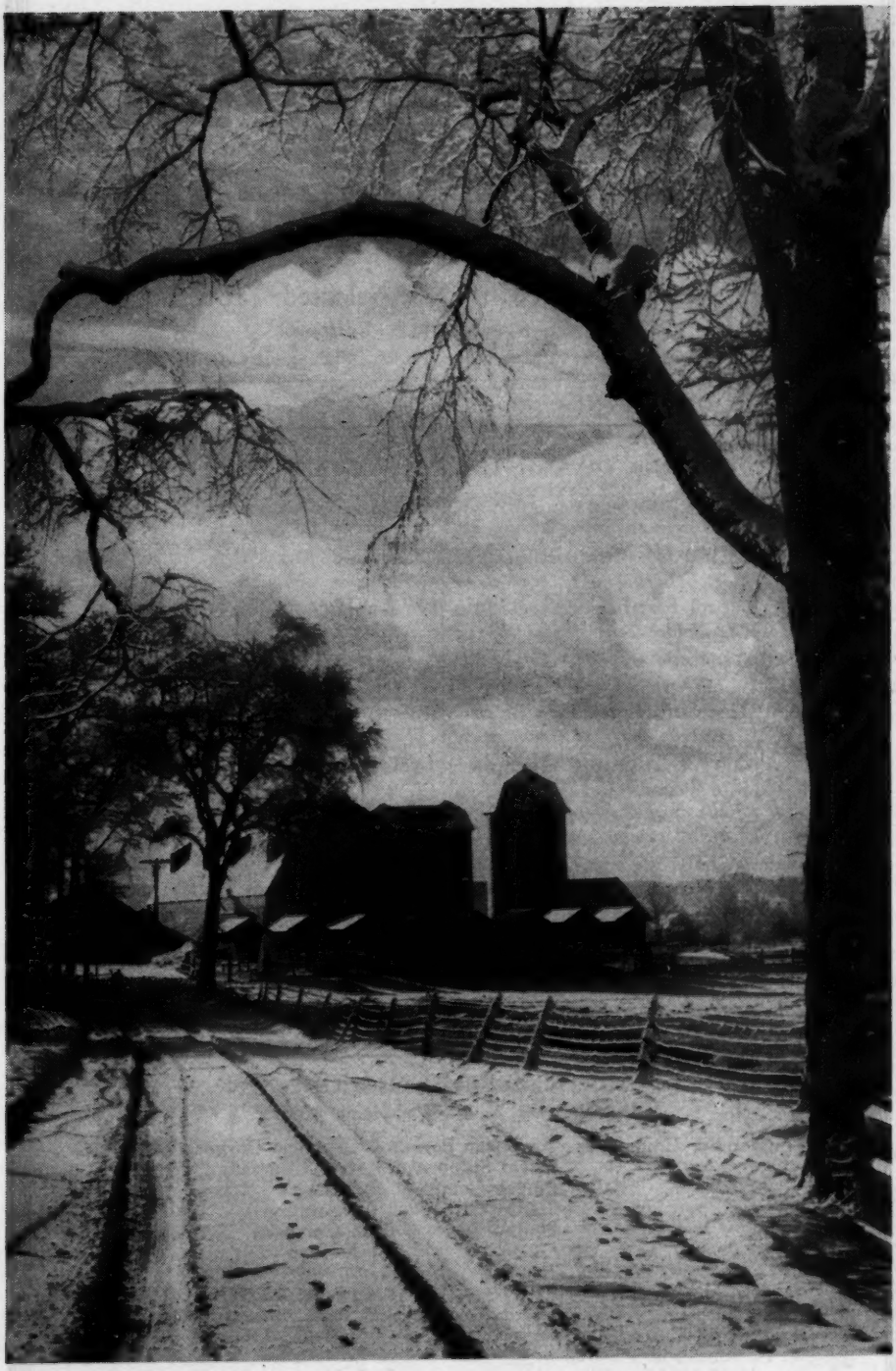

Snug Housing

Better Crops with PLANT FOOD

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VOL. XXXVIII WASHINGTON, D. C., JANUARY 1954 No. 1

We all know . . .

Persons of Simplicity

Jeff McDermid

IT has always seemed to me that persons of simplicity and trusting character are not so rare as many suppose in this modern era of strife and material shrewdness. How they manage to retain those traits and live quite happily has often perplexed their friends and neighbors who often cultivated quite different philosophies of living.

One of my oldest friends and close associates told me his story recently which reveals a full life span wherein simplicity toward the world and a grave open-hearted trust in the purposes of other folks were paramount. Like the majority of individuals who are thus dominated by a relatively simple attitude and think others are the same, this fellow made little money. He landed in the midst of inflation with a dwarfed reserve and a decidedly modest income from which to build it, —but these, he declared, had not stemmed from his simple faith in others and his own homespun and unfrilled outlook and ambition.

Not only did my friend display those traits to a high degree, but he courted and married a young woman whose backgrounds were similar to his own in this respect. Both were warm-hearted and generous, felt that their friends and acquaintances were ace-high and reliable, sought to please and entertain them, accepted new associates with calm assessment at par face value, and were unsparing in their zeal to hold up their own end of things and perform their share of community duties and responsibilities, no matter how great the temporary discomfort. Not only that, but they were alike united in a physical simplicity, neither one having had heated romantic affairs and experiences prior to wedlock.

Maybe they were babes in the woods as things of that kind run, but yet this same inward honesty and openness of makeup operated wholesomely to their credit and favor, and led to none of that frustrated disillusionment that so many of the phychologists encounter, at least between partners not so trusting and mutually honorable to the core as were these two friends of mine.

To begin with, their wedding was simple and neither asked or expected anyone to shower them with showy gifts or strew roses on their honeymoon trail. It was a quiet ceremony in the bride's small home, the altar being the fireplace mantel decked with home-grown flowers—the cozy spot where so many hearth fires had been lighted and so many juvenile games and social hours partaken. Each person in the modest list of guests seemed to them like sincere good-will offerings from childhood friends, whose mere presence alone was a blessing on the nuptial hours.

Their wedding journey was a simple little affair, not over fifty miles of travel both ways. The bride wore a gown that she and her mother had made from dime-store patterns in the pleasant weeks before the grave parson opened the Book that served as the sanctified preface to their hopeful lives. No professional dress designer was required to bring out the native grace and charm of the pretty bride.

UPON returning, they settled in a tiny flat whose front windows gave a view of the simple country town with elm-lined streets, and where the same stars and waxing moon shone through the panes to charm them as it did in days of dawning love. Their kitchen was the kind that happened to most young couples shortly after the turn of the twentieth century. It had a small gas range, a high and rather awkward brown-stained kitchen cabinet, and a bright rear window where a yellow canary might sing and frilly white muslin curtains wave in every fresh breeze of that happy Junetime. No brisk real estate barons thrust shiny and expensive gadgets, like electric refrigerators and automatic dishwashers, upon them as part of a combination "deal." No blatant itinerant salesmen succeeded in selling them numerous trinkets and utensils they could get along well enough without. Both were thrifty in a sense and, moreover, had no lust for uncommon things to make their lives sublime.

Right here is where their simple outlook and desires clash hard with some of the later shades of domestic economy. It might be argued with some degree of truth that a wife's place is to spur her spouse onward to get the good things of life, perhaps by making obligations somewhat beyond the current purse—which he must hustle and bustle to earn and enjoy.

But no such idea occurred to these simple folk. They knew not that they actually stood at a social crossroads, the advent of a time when old values were gone and new and standardized ones were taking their place in normal households. They did not glance far ahead of their new romance to vision a time when the old furniture would be out of date, the old rug frayed, the wedding plates cracked, and a new level of luxury living dominating their once humble and contented circle.

SO all these signs and portents of a new era of family ambitions passed these people by like a fleeting summer wind. They sensed no change. They harbored no resentment or envy when other newlyweds piled into the lap of luxury and left them in somewhat shabby, albeit happy, gentility. Instead they dreamed along in the snugness of their chosen nest and when the kiddies finally came, they too were accepted at face value and cuddled and properly raised along patterns long since deemed insufficient. It is true that the bride armed herself with a battered Fanny Farmer cook book and a Dr. Holt's baby treatise, to be snatched up in times of croup or sudden indigestion—just as the bridge devotees today peruse the

pages of their favorite card authority.

All they asked of their offspring was decency, stability, honesty, and above all—simple sincerity. They argued that a child thus reared could exert firm and sensible judgments, know his way about, and not be saddened or distraught by the possessions and privileges enjoyed by their playmates, but to them denied.

And I myself may testify that for the

most part these essentials for child raising were enough, having been in their home many times and finding the family at ease and without evidences of strain or juvenile disquiet or unrest. Even today there exists ample evidence that these rather simple and naive rules of child culture—measured with modern methods—fashioned a foundation that stood the test of time and both depression and inflation.

The combination of sincerity and simplicity with which the kids were reared had something to do with the success of their education and the subsequent marriages that the offspring contracted. In short, if there be a drawback to simplicity as far as finances and getting ahead in the world are concerned, there has not been a trace of failure on that pattern when applied to the far more vital job of bringing good citizens to maturity and responsibility. My friend himself has said that while he was probably "too simple" and open-faced to win in the financial poker game, he and his wife scored high on the board when the more important trumps of life were called for.

Thus we have another delightful effect to ponder upon. These two persons of great simplicity have no regrets that this was their cue in life's drama. When one of them leaves this world and the other remains, there shall be not the slightest twinge of remorse for money not banked away for providing what might have been a fuller life gadgetwise or otherwise materially. So long as the faces of the children remain happy over reminiscences of childhood, and apply that simplicity in their own homes, these parents may feel amply repaid for their homely and simple living.

No walk of life seems to have any strict corner on the attribute of simplicity. Neither do varied degrees of material prosperity always mark out the persons who take a plain and unsophisticated view of life and its duties and problems.

I have observed men of no means and no positive values or standing show a sort of air that is the direct opposite of simplicity. They often talk in big terms and claim to have attained great stature, or manifest a sneaking jealousy of others. Through some faulty standards acquired during a life of grubbing and conniving to get selfish rewards that never came, these persons present a queer combination of traits which are resolved into rabid fear. And when tranquility is gone and no anchors are available, the mental calmness of true simplicity cannot take over.

IT has been said that fellows who acquire great riches could not have done it while courting the simple things of life. This is often true, but here and there my acquaintances of wealth have demonstrated real interest in doing the heartwarming and simple things which make so much difference in man's

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Some Crop Potentialities in North Carolina

By W. E. Colwell

Department of Agronomy, North Carolina State College, Raleigh, North Carolina

THE first county agent in North Carolina was James A. Butler, appointed on November 18, 1907. Two days later he arranged with J. F. Eagles of Statesville to undertake a demonstration which included the production of 2½ acres of corn, according to the recommendations of the U. S. Department of Agriculture.

Nearly a half century of research and educational work has made its mark following this demonstration. As plans are made to chart the course for the second 50 years of the twentieth century it is well to examine the present state of technology and to see how effectively it is being utilized. One would like to think that progress will be made more rapidly during this second 50 years. The need to increase the productive capacity of each agricultural worker is in sharp focus today. Principles of soil management are better understood. Programs in both research and extension are more complete.

Farmer interest has been developed. This is evidenced by the fact that in North Carolina, for example, county boards of agriculture appropriate over one million dollars annually for cooperative extension work in the counties. This is being done under legislative authorization obtained 43 years ago, so it represents the growth during that period. "If the results did not meet with general approval on the part of the public, it would soon reflect itself in the withdrawal of county support." (Schaub)*

The progress over the past 50 years as measured in terms of increased production per acre should be analyzed from the standpoint of how much improved is technology *per se* and how well is this technology being adopted on the farm. The recent discussion of this problem by Shaw** has called our attention to some very interesting relationships and it is the purpose of this paper to look at the production records and potentials of several crops of major importance to North Carolina. To facilitate this comparison, the highest yield records from experiment station tests are plotted along with State averages over a period of years. A smooth curve is drawn at the high points indicating the potential yield values attainable with the known technology of the time.

Wheat

It is noted in Fig. 1 that the State average yield was under 10 bushels per acre from 1900 to the mid 1930's.

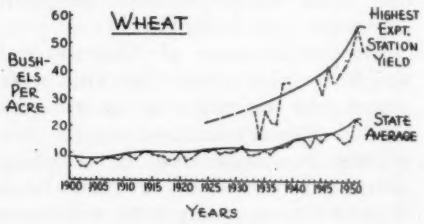

Fig. 1

Highest experiment station yields are unavailable for the early part of the

* Agricultural Extension Work, a Brief History. I. O. Schaub. N. C. Agri. Extension Service Circular 377, Nov. 1953.

** The Role of Research in Meeting Future Agricultural Requirements. Byron T. Shaw. Agronomy Journal *45*(3):85-92. 1953.

century but the data available as plotted on the upper curve of Fig. 1 indicate that it wasn't until after 1935 that the research frontier was advanced so that by 1950 maximum yields of 55 bushels per acre were attained. The latter part of this rise followed the introduction of higher yielding varieties, especially Atlas 50, Atlas 66, Coker 47-27, Anderson, and Taylor. It also followed studies on seedbed preparation, date of seeding, and higher fertilization rate, especially nitrogen. A combination of factors was found to be involved and when all were put together properly the result was 55 bushels.

On the State curve one plateau was broken around 1937 with gradual rise to 1947. New heights were attained in 1951, 1952, and 1953 (the 1953 yield not shown on curve was 20.5 bushels). The last three values reflect the use of better seed of the improved varieties, heavier fertilization, early topdressing, and adoption of other practices brought to the attention of the public through a vigorous small grain extension program. It is interesting that the State average yield for these three years corresponds closely to the maximum that technology of approximately 25 years previous was able to produce. Certainly had the ceiling not been raised to a level far above the 20 to 25 bushels per acre, the State average couldn't have been that high. One wonders if in another 25 years the average might not be closer to 55. He could reason that doubling the average of today to 40 or 50 bushels wouldn't be any more out of line than a similar thought 25 years ago when it was a matter of doubling it from 12 to near 25. However, the wheat curve of Ohio, as reported by Shaw, doesn't reflect a "second doubling." The research advance in Ohio came from 1910 to 1926 (from 1938 to 1950 in North Carolina). According to Shaw, "The research frontier has not advanced in the last 20 years and this has been followed by a leveling off of the average wheat producer's frontier." Ohio experienced its research advance 25 to 30 years ahead of that in North Carolina. It experienced its producer's advance 20 years ago or more as contrasted to the 1951-52-53 dates in North Carolina. New knowledge is now needed to penetrate the yield ceiling of around 60 bushels.

Temporary surpluses of stored grain should not deter the initiation of fundamental studies directed to discover the limiting factors and means of overcoming them. "It takes a lot of running to keep from falling back" is an expression used by Dr. Shaw to describe the general situation with respect to small grains.

Oats

Many of the same considerations apply to oats, but the gap between practice and potential is greater. The research frontier has advanced considerably during the past 10 years, the principal varietal developments being Victorgrain and Arlington. The new practices haven't been adopted quite to the same extent as with wheat but the "average oat farmer" is beginning to experience some benefit of new technology.

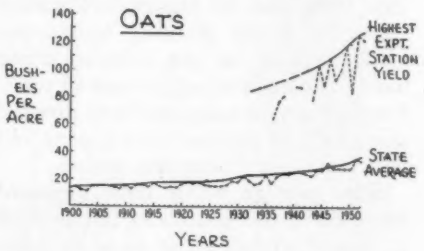

Fig. 2

Cotton

In 1892 the cotton boll-weevil crossed into Texas from Mexico. Soon after the turn of the century research was initiated to combat the pest, $250,000 being appropriated by the National Congress. Though progress has been made one might ask how adequate or how practical are the best control techniques when this insect some 50 years later (1950) was largely responsible for

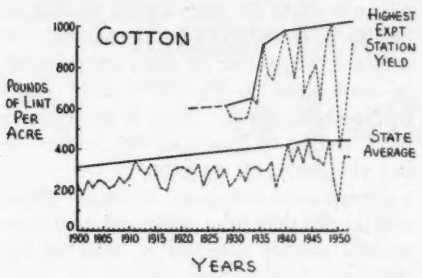

Fig. 3

a cut in production from an expected 350 to 400 pounds of lint per acre to 150.

Examination of the cotton data in Fig. 3 reveals that the only substantial research advance recorded occurred during the late and mid 1930's. Best information at hand suggests that this was due chiefly to the Coker 100 variety which was introduced commercially in 1937-1938, and to higher fertilization rates and better planting techniques. Little advance on the research curve has been noted during the past 15 years. Emphasis in breeding has been directed along lines of superior fiber quality and wilt resistance during the period.

State average yields have increased from about 200 pounds of lint in 1900 to around 400 or more some 50 years later, but full potential is far from being realized. In fact, it is estimated that current production represents only 34 per cent of the potential on this crop in North Carolina; 38 per cent in the Southern region.* A part of this low production may be attributed to inadequate fertilization, as the average fertilization rate on cotton in North Carolina is estimated to be only 21 pounds N, 55 pounds P_2O_5, and 36 pounds K_2O per acre.

These facts certainly point to a tremendous gap between the potential production and the common practice. They also focus attention on the 15-year plateau of the best technology. It should be pointed out that the 5-acre contest winners in North Carolina during the years 1946-1950, the period in which the contest was conducted, attained a production higher than the figures cited in Fig. 3. These yields rose to 1,430 pounds lint per acre, and though the yield was estimated, it does indicate a potential production somewhat higher than that recorded in the graph.

Tobacco

One of the most striking features of the tobacco (flue-cured) yield data recorded in Fig. 4 is that the current State average is approximately equal to the experiment station's highest yield of 25 years ago. Also the gap between the State average and the highest station yield is relatively narrow even

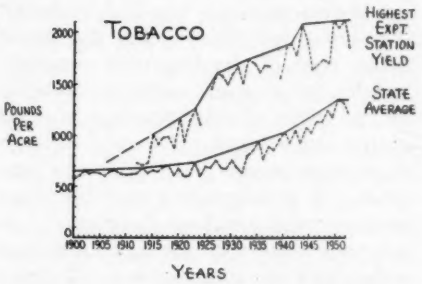

Fig. 4

though sizeable. When State yields are considered by belt, the gap is even closer. For example, in 1953 the average yield in the Border Belt rose to an all-time high of 1,405 pounds per acre.

Heavier fertilization, closer spacing, priming instead of cutting the entire stalk, all contributed to the rise in both curves. Federal acreage control since the 30's is credited with a marked influence on the State yield curve. Since tobacco is such a high value crop, it is not surprising that recommended practices are adopted relatively quickly. It is estimated that 77 per cent of the production potential is being realized with this crop.

It is evident that the yield ceiling hasn't been raised much during the past 10 years. Research emphasis has been

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* Report No. 1, Fertilizer Work Group of the National Soil & Fertilizer Research Committee, July 1951.

High-level Fertility Makes Balbo Rye Roots More Effective

By H. J. Snider

Urbana, Illinois

IT is generally conceded that available fertility in the soil is largely responsible for crop growth, including the development of roots. It has been observed that a proper balance and an adequate supply of nutritional elements produce more vigorous root action which in turn gives a lusty top growth and as a rule develops into larger acre yields. It is apparent that the root system develops in proportion to the supply of available fertility in the surface soil along with the needs of top growth. On a poor soil the proportion of roots to tops may be considerably larger which may be an indication that a lack of balance or a short supply of plant food in the soil prevented the top growth from attaining desirable proportions.

There are also indications that crop roots act similarly to a garden hose which serves to conduct water and nutritional elements from soil into the top growth regardless of the proportion of roots to tops. Apparently a large top growth does not necessarily call for a proportionately larger root growth. It is apparent that in some cases the root system acts more intensively in supplying the top growth with water and plant food. The important factor in root function and development is the available supply of plant food in the topsoil.

In some field tests with Balbo rye on the Elizabethtown and Newton experiment fields an effort was made to study root development and composition in relation to top growth and soil fer-

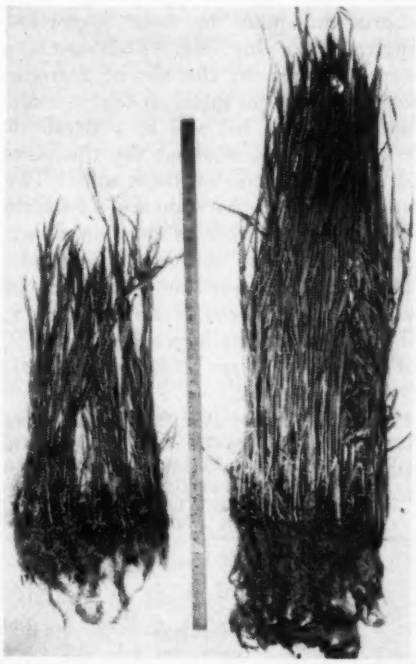

Fig. 1. Balbo rye tops and roots removed from the Elizabethtown Experiment Field April 15, 1952. This rye was seeded in 8-inch drill rows Sept. 4, 1951, at the rate of 1½ bushels an acre. The rye plants on the left were grown on untreated land and were made up of 64% tops and 34% roots on dry basis. The plants on the right were grown on land treated with limestone, superphosphate, and ammonium nitrate and were made up of 74.1% tops and 25.9% roots. These plants were taken from a single drill row. The block of soil removed in a metal frame was 8 inches wide, 12 inches long, and 9 inches deep.

TABLE I.—BALBO RYE TOPS AND ROOTS WITH PERCENTAGES OF DRY MATTER, NITROGEN, AND POTASSIUM AT THE APPEARANCE OF FIRST HEAD STAGE (APR. 15, 1952) ELIZABETHTOWN FIELD. AVA SILT LOAM SOIL

Soil treatment	Part of plant	Percentage		
		DM	N	K
None.....	Tops	64.0	1.52	1.74
	Roots	36.0	.88	.59
LN.....	Tops	64.4	1.50	1.59
	Roots	35.6	.76	.63
LPN.....	Tops	74.1	1.36	1.50
	Roots	25.9	.86	.70

L—limestone, N—ammonium nitrate, 200 lbs., P—0-20-0-200 lbs.

tilization. While limited in scope these efforts did point to some important angles along this line. Root samples were obtained by the use of a frame made out of thin metal so that it could be forced into the soil to a depth of 9 inches. This is about the thickness of the A_1 horizon on these soils. The frame was 8 inches wide and 12 inches long and was centered over an 8-inch drill row when collecting a sample. The roots contained in this block of soil were washed out as shown in Fig. 1. It is expected that approximately 90% of the roots were obtained by this method although no work has been done to determine the exactness of this percentage.

TABLE II.—BALBO RYE TOPS AND ROOTS WITH PERCENTAGES OF DRY MATTER, NITROGEN, AND POTASSIUM AT FULL HEAD STAGE (MAY 6, 1952) NEWTON FIELD—CISNE SILT LOAM SOIL

Soil treatment	Part of plant	Percentage		
		DM	N	K
Lime.....	Tops	42.4	1.92	1.90
	Roots	57.6	1.02	.41
LP.....	Tops	54.6	1.18	1.60
	Roots	45.4	1.04	.46
LPK.....	Tops	64.3	1.38	2.07
	Roots	35.7	.88	.71

L—limestone, P—0-20-0-500 lbs., K—60% muriate 400 lbs.

TABLE III.—BALBO RYE TOPS AND ROOTS WITH ACRE YIELD OF DRY MATTER, NITROGEN, PHOSPHORUS, AND POTASSIUM AT ABOUT FULL HEAD STAGE (APR. 24, 1952) ELIZABETHTOWN FIELD. AVA SILT LOAM SOIL

Soil treatment	Part of plant	Pounds per Acre			
		DM	N	P	K
None..	Tops	2250	34.2	4.7	39.1
	Roots	1260	10.3	1.8	7.4
	Total	3510	44.5	6.5	46.5
LPN..	Tops	7890	107.3	26.0	118.3
	Roots	2760	23.7	5.2	19.3
	Total	10650	131.0	31.2	137.6

L—limestone, P—superphosphate 200 lbs., N—ammonium nitrate 200 lbs.

On Ava silt loam of the Elizabethtown field the roots amounted to about one third of the total growth except on well treated land (LPN) where the proportion of roots dropped to about one fourth (Table I). The treatment of limestone, superphosphate, and ammonium nitrate forced the top growth out of proportion to that on plots where the fertilization was not so complete. Nitrogen and potassium contents of the top growth were slightly higher on untreated land largely due to the much smaller growth (Table III and Fig. 1).

Balbo rye grown on Cisne silt loam, Newton field, had a root and top growth which were more equal where potash fertilizer was omitted from the soil treatment (L and LP Table II). Where potash was used (LPK) the root growth assumed the one-third proportion and the potassium content of the tops and roots showed the effects of the potash fertilizer. This soil type is decidedly deficient in available potassium, so that practically no satisfactory

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Farm Income in 1954

By P. O. Davis

Director of Extension, Alabama Polytechnic Institute, Auburn, Alabama

FOR two years farmers have been operating under a price squeeze due to lower selling prices and higher buying prices. All prices paid were not higher and, perhaps, a few were lower, but the over-all prices paid by farmers were up, while selling prices were going down.

Prices received by farmers hit a peak in February 1952. Since then they have fallen 23 per cent. Most of this drop was in the last half of 1952.

The feeling is that present farm prices are being stabilized at about the current level. Some have advanced over the level of a year ago. Hogs are an example of this but no one knows what the future will bring for any product.

And price squeeze isn't all. A production squeeze is on. It's especially severe on cotton growers who had no controls during the three years of 1951-53 and could plant without restrictions. At the December 15 referendum cotton growers voted overwhelmingly for marketing quotas in order to have prices supported at 90 per cent of parity. Prior to that referendum the Secretary of Agriculture had announced 17,910,488 acres for marketing quotas in 1954. This compares with 25,376,000 acres planted in 1953. Thus we see a hard squeeze in land use.

The application of it is best understood by state application. I'll use my own State of Alabama, which is rather similar to other states of this area.

In 1953 Alabama farmers planted 1,630,000 acres in cotton. The Alabama allotment for 1954 is 1,139,121 acres, a drop of 490,879 acres. (Congress may change the total shortly after convening in January but no one knows as this is being written what will be done, if anything.)

For Alabama cotton growers this means 30 per cent fewer acres to cotton in 1954 than in 1953 when cotton brought to Alabama farmers nearly half of their total cash income. We see, therefore, that 30 per cent fewer acres could reduce the State's 1954 agricultural income by 30 per cent of 50, or by approximately 15 per cent of the 1953 total. This assumes, of course, that other factors will be the same.

But farmers can change this figure. They can do it by producing more cotton on each acre planted and by increasing their production of other crops, livestock, and poultry.

To hold 1954 income up to 1953, each farmer must use all of his labor and his land in the most efficient way, and for producing products for which there is a market at good prices.

Let's be specific about cotton production in 1954. Bigger yields per acre come from better soil preparation and good cultural practices, good seed of the right varieties, planting at the best time, more fertilizer of the right kind, and effective insect control.

Use More Fertilizer

Dalton R. Harbor, of our State Extension Staff at Auburn, tells me that 1954 will not be a year for farmers to retrench in the use of fertilizer. On the other hand, it should pay more than in recent years. So he advocates more fertilizer per acre with emphasis upon good fertilizer that produces the most cotton per dollar invested in fertilizer.

"In 1953," said Mr. Harbor, "Alabama farmers used an average of 500

pounds of fertilizer per acre for cotton. More net income from cotton in 1954 can be attained by applying 500 pounds of the best complete fertilizer plus sidedressing later with either 250 pounds of nitrate of soda or 125 pounds of ammonium nitrate."

In brief, Mr. Harbor recommends that farmers increase by the amount of the topdressing. If done, it should pay well in the form of more cotton per acre at a lower cost per pound.

Soil-testing work by the Experiment Station at Auburn has revealed more information in behalf of using a 4-12-12 formula as a complete fertilizer for cotton. The Harbor recommendation, in brief, is 500 pounds of 4-12-12 plus sidedressing as just stated.

These tests, plus research and farmer experience, are emphasizing the importance of more potash for cotton and other crops, and also more lime, especially in rotations with legumes. Use of ammonium nitrate is souring Alabama farm lands and, therefore, calling for more lime.

Other Important Factors

Here are other good ways for Alabama farmers to help their 1954 income:

1) More acres in corn, provided good cultural practices are followed. This includes good seed, a good seedbed of good land for corn, proper spacing, and enough fertilizer of the right kind. To such production add a paying plan for using corn to increase farm income.

2) More home-grown feed and better pastures for livestock.

3) More and better attention to hogs. Both little and big farms are well adapted to hogs on home-produced feed. G. B. Phillips, Extension Swine Specialist at Auburn, places much emphasis upon growing grain, growing and grazing home-raised pigs in a sound and profitable hog program. Hog prices look good for 1954 and 1955.

4) Hens and broilers are promising also. Alabama producers are not supplying the State's consumption of eggs by a long shot. Egg farming properly done is good farming. The same is true of broilers.

5) More Alabama farmers are trying soybeans. Before planting, however, each farmer should consider harvesting, or the availability of harvesting machinery.

6) Home production of food in gardens pays well. This should be a banner year for it. Most farmers have land and other essentials for a good garden. My experience for many years has convinced me that a home garden has many advantages, the chief of which is good food for the family. An acre, or less, used wisely as a vegetable garden can be the most profitable acre on the farm. And it's a lot of fun to make a good garden.

A Challenge to Be Met

There are, of course, other ways for farmers to help themselves meet a tough situation in 1954. It's a challenge to each and every farmer to plan for the best operations with his labor, his land, his equipment, and his capital. Now, as never before, successful farming includes efficient use of labor, sound use of all land, and the production of products in demand either at home or on the market.

It will be a testing year for farmers everywhere but especially in the South. All who fail to operate efficiently will find themselves in trouble at the end of the year. County agents can be very helpful with plans as well as procedures.

Most that I have said is about this year, 1954. It's already time to begin planning for 1955. Present indications are that quotas will be in force for both cotton and peanuts.

Therefore, wisdom challenges us to plan and proceed accordingly. This involves a look at the years ahead and a plan that will be best so far as we can now foresee.

Soil Test Summaries Can Be of Value to Many Groups

By J. W. Fitts

Director, Soil Testing Division, Department of Agriculture, Raleigh, North Carolina

THE most common use of soil tests is for making fertilizer and lime recommendations. The tests are designed to evaluate the fertility status of soils but recommendations must be made for crop production of which soil fertility is only one of the important factors. In making recommendations for fertilizer and lime use based on soil test results, consideration must be given to the kind of crop, thickness of stand, inherent variability of the soil, climatic conditions, and other variable factors. The usefulness of the soil tests depends, of course, upon their careful calibration with the response of crops to applications of fertilizer and lime. Soil test interpretations can be no better than the research upon which the interpretations are based. Soil samples from many field and greenhouse studies are needed for calibration purposes to cover the range of conditions encountered in testing.

Classifying the Results

The results of soil tests usually are reported as very low, low, medium, high, or very high. Differences of meaning are associated with this classification by different laboratories. Some laboratories recommend fertilizers for all classes but apply only a maintenance quantity for soils regarded as high or very high in order to sustain maximum production. Other laboratories regard soils that are high or very high as not needing additional fertilizer or lime. Crops vary in their requirements and ability to obtain various essential elements. Therefore, results that might be considered medium for one crop may be low for another. This creates a problem when an attempt is made to classify a soil for all crops.

Soil Test Summaries

Carefully conducted soil tests can be useful for purposes other than making lime and fertilizer recommendations to farmers. Summaries of soil test results can be of great value to educational agencies, research workers, and commercial companies when prepared on a county, regional, or state basis. In North Carolina several summaries have been prepared on a county basis. In 1951, a summary was published (1) on a county, a cropping area, and state basis. In Iowa, summaries have been prepared on a county, soil association area, and a state basis each year since 1948. Several other laboratories have prepared periodic summaries of their results. It is the purpose of this paper to present some methods for summarizing soil test results and to discuss how they may be used to the greatest advantage.

Bias of Results

The soil test summaries will have some bias because the more progressive farmers will make the greatest use of the service. (1) A higher percentage of samples from a given region also may come from one or two crops in relation to other crops. For example more samples may be taken from crops as tobacco and cotton than pastures in the same region. Some samples are taken from "trouble areas" too. Where a

large number of samples are tested each year, more representative samples from an area will be received and the bias decreased or stabilized to some extent. In both Iowa and North Carolina when over 40,000 samples are tested each year the summaries on an area basis do not vary greatly from one year to another, but when less than 10,000 samples were tested per year there was some variation. As the number tested each year increases, the variability between years decreases. This does not mean necessarily, however, that the bias is greatly decreased. Recent studies in North Carolina (2) indicate the amount of bias obtained in soil test summaries is relatively small.

Distribution of Samples

The number of samples tested in an area will influence the summary. The number of samples taken in a county apparently is related to local interest rather than location within the state. Good cooperation between local agricultural agencies is essential for a successful soil-testing program. Some counties test enough samples each year that a summary will present a fairly good picture of the fertility and acidity status of their soils, but other counties do not. The number of samples tested in each of the cropping or soil association areas, however, usually is sufficiently large to overcome variabilities between counties.

Selection of Areas for Preparing Summaries

In most states, a county is the smallest unit desirable to prepare summaries. County Agents or other local agricultural leaders may wish to prepare summaries on a township basis for use in meetings in these areas. It is useless to attempt this unless a sufficient number of samples to give a fairly representative picture has been taken. It is even questionable if satisfactory summaries can be prepared on a county basis when the number of samples taken has not been large or they have come mostly from one part of the county. Since local agricultural agencies frequently operate on a county basis and desire the information for their use, county summaries are desirable.

Most laboratories recommend taking soil samples to plow depth or 0-6 inches. For pasture samples, several suggest 0 to 2 inches as the most desirable depth. These depths do not reflect the total feeding zone of plants but do indicate the zone where past management has had its greatest effect and the zone of greatest biological activity. The past management may be responsible for a build-up of certain elements such as phosphorus or calcium in the soil. It may also be responsible for greatest depletion due to heavy cropping without fertilization or liming. These conditions should be considered in selecting the areas to prepare the summaries. For example, in North Carolina fertilizers have been used for many years especially on crops like tobacco and potatoes. The phosphorus level has built up in the soils where these crops have predominated and has masked out differences that exist between virgin soil types. Therefore a summary based on cropping areas is more valuable than one based only on soil association areas. In contrast to this, the use of commercial fertilizers is a relatively new practice in Iowa where the major crops are corn, small grains, and legumes, which are grown in rotation. A soil test summary on a soil association basis is very helpful since it projects past management on soil type.

Two-way Tables for Soil Test Summaries

Many soil test summaries consist of tables or diagrams in which the percentage of samples testing very low, low, medium, high, or very high is shown. It is impossible to determine any relationship between elements in such tables, but this is very important for determining the ratio of fertilizers needed. Information of the relative amounts of each ratio of fertilizer for

TABLE I.—THE PERCENTAGE DISTRIBUTION OF PHOSPHORUS AND POTASSIUM SOIL TEST RESULTS—DELAWARE COUNTY, IOWA—1948 THROUGH 1951—NON-CALCAREOUS SOILS—TOTAL NUMBER SAMPLES 3,092

PHOSPHORUS (Read across)	POTASSIUM (Read down)					Total for phosphorus (Read down)
	V. High	High	Medium	Low	V. Low	
	%	%	%	%	%	%
V. High	1.8	0.8	1.6	1.6	0.4	6.2
High	1.0	1.4	3.3	3.4	1.0	10.1
Medium	0.7	1.5	5.7	6.3	1.8	16.0
Low	1.4	3.2	14.1	24.3	8.6	51.6
V. Low	0.1	0.4	1.7	8.5	5.4	16.1
Total for Potassium (Read across)	5.0	7.3	26.4	44.1	17.2	

an area is helpful not only to educational agencies but to commercial companies in preparation and distribution of materials.

It is difficult to show the relationship of more than two elements in a table or diagram. Phosphorus and potassium, when summarized together, however, give a good indication of the ratio of fertilizers needed most. Soil productivity also can be expressed with two-way tables of pH and organic matter. Two-way tables can be prepared for summaries on any size area such as a county or regional basis. Tables may be prepared for specific crops such as tobacco for a given area too. A summary of soil test results for Delaware County, Iowa, for a 4-year period is shown in Table I and for a soil association area is shown in Table II.

The total columns on the right and at the bottom of each table show the percentage of samples very low to very high in both phosphorus and potassium but do not show the relationship between the two. In Table I, of the 16.1% very low in phosphorus, 0.1% are very high, 0.4% high, 1.7% medium, 8.5% low, and 5.4% very low

TABLE II.—THE PERCENTAGE DISTRIBUTION OF PHOSPHORUS AND POTASSIUM SOIL TEST RESULTS—IOWA SOIL ASSOCIATION AREA 1—1948 THROUGH 1951—NON-CALCAREOUS SOILS—TOTAL NUMBER SAMPLES 17,067

PHOSPHORUS (Read across)	POTASSIUM (Read down)					Total for phosphorus (Read down)
	V. High	High	Medium	Low	V. Low	
	%	%	%	%	%	%
V. High	2.6	1.0	0.9	0.3	0.1	4.9
High	2.1	2.1	2.3	1.1	0.1	7.7
Medium	2.1	3.5	5.3	3.6	0.3	14.8
Low	3.7	9.3	22.4	19.4	1.5	56.3
V. Low	0.4	1.5	5.4	8.2	0.8	16.3
Total for Potassium (Read across)	10.9	17.4	36.3	32.6	2.8	

in potassium. Of the 17.2% of samples very low in potassium, 0.4% are very high, 1.0% medium, 8.6% low, and 5.4% very low in phosphorus.

It can be readily seen that soils low in phosphorus are not necessarily low in potassium. In fact one of the outstanding characteristics of the two-way table is the widespread distribution of results. Generally, less than 25% of the samples occur in any one group. The tables may be blocked off to show the pounds of P_2O_5 and K_2O recommended for various crops (1). For example, soils testing high and very high in both phosphorus and potassium may receive a 1-1-1 ratio fertilizer for maintenance or starter purposes. Soils low in phosphorus but medium in potassium might require a 1-4-2 ratio for certain crops. The very low phosphorus soils may receive application of superphosphate in addition to a mixed fertilizer. From these tables fertilizer dealers can see the ratios of fertilizers needed most in local farming conditions. Slides or large charts can be made of the tables for use in educational meetings to show the need for testing each field for the most reliable information for the cropping system followed.

Further separations of the soil test results can be made by preparing similar tables for certain pH ranges. In Tables I and II only non-calcareous samples were included. Other tables can be prepared for calcareous samples, when the number tested is sufficiently large to warrant preparation of such tables. The extremely acid soils can be separated too or separations made by type of colloid if 2:1 and 1:1 clays can be separated by areas.

The effect of past management on soil test results is well illustrated in Table III which shows the results of soil tests on tobacco fields in Wayne County, North Carolina. Relatively heavy use of fertilizer on tobacco has resulted in a build-up of phosphorus. The table indicates 94% of the samples tested were high in phosphorus but the amount of potassium is well distributed. Obviously a general fertilizer recommendation will be more applicable here due to past management than indicated on the results from Iowa. A fertilizer grade having more nitrogen and potassium in relation to phosphorus is being recommended for these conditions but variations in the amounts of nitrogen and potash to apply must be made according to soil test results and management practices.

In order to compare soils of one area with soils of another, it is necessary to

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TABLE III.—THE PERCENTAGE DISTRIBUTION OF PHOSPHORUS AND POTASSIUM SOIL TEST RESULTS—WAYNE COUNTY, NORTH CAROLINA—JULY 1, 1951, TO JUNE 30, 1952—TOBACCO FIELDS—TOTAL NUMBER OF SAMPLES 408

PHOSPHORUS (Read across)	POTASSIUM (Read down)					Total for phosphorus (Read down)
	V. High	High	Medium	Low	V. Low	
	%	%	%	%	%	%
V. High	6	14	26	26	6	78
High	0	1	3	7	5	16
Medium	0	0	1	3	1	5
Low	0	0	0	0	1	1
V. Low	0	0	0	0	0	0
Total for Potassium (Read across)	6	15	30	36	13	

Relation of Potash & Phosphate to Cold Injury of Moore Pecans

By R. H. Sharpe, G. H. Blackmon, and Nathan Gammon, Jr.

University of Florida Agricultural Experiment Station, Gainesville, Florida

IN the winter of 1950-51, considerable winter injury occurred on Moore pecan trees at the North Florida Experiment Station's orchard at Quincy, Florida. A temperature low of 19°F. on November 25, was probably a primary cause of injury, as the trees were still in full leaf condition at that time. Loss of foliage from scab and aphids in July and August and delayed maturity of summer growth were factors predisposing the trees to injury. Under similar conditions, Stuart and Moneymaker varieties were less injured by scab and aphids, had much less summer growth, and were not injured by cold. Moore variety trees in another experimental orchard near Monticello, Florida, showed similar injury. Preliminary inspection indicated the degree of injury was related to previous fertilizer practice so a more detailed study was undertaken to determine the extent of this relationship.

Methods

Ratings for extent of injury were made May 17, 1951, on a score from 1 to 4 as follows:

1. None to very light.
2. Light—some twigs up to ½" diameter killed.
3. Medium—twigs up to 2" diameter killed or over 25% of terminal shoots—no framework injury.
4. Severe—twigs over 2" diameter killed and over 75% of terminal shoots—framework of tree badly hurt.

A typical tree given the score of 4 is shown in Figure 1, with less injured trees in the background. Data were subjected to analysis of variance to determine the differences that were statistically significant.

At the Quincy orchard, the trees had been fertilized experimentally with 0, 5, or 10 lbs. per tree of muriate of potash in all possible combinations with 0, 20, or 40 lbs. of superphosphate per tree in a factorial design. The fertilizer was applied annually under the branch spread in early spring. The trees were set on newly cleared land in 1937 and the fertilizer treatments made from 1946 to 1950. Previous to this experiment, intercrops or legume covers were

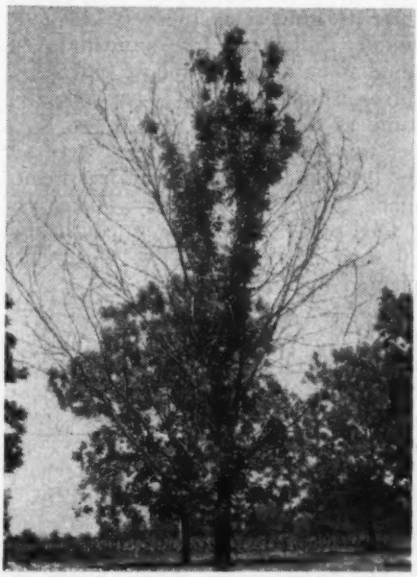

Fig. 1. Moore tree showing severe winter injury, North Florida Experiment Station, June 1951.

Fig. 2. Crimson clover cover crop in orchard at North Florida Station, April 1952. Tree in the foreground is typical of those in potash plots which showed little winter injury.

grown under commonly recommended practices. There were 10 replications of each treatment, in single tree plots, making 90 trees altogether in the experiment.

In the Monticello orchard, there were three treatments as follows: (1) Zinc sulfate, 2 lbs. per tree annually; (2) same amount of zinc sulfate plus 2 lbs. nitrogen and 2 lbs. P_2O_5 per tree; (3) same as treatment 2, plus 4 lbs. K_2O per tree annually. The trees were set in 1912 and the fertilizer treatments made from 1941 to 1949. There was a total of 14 trees in treatment 1, and 20 each in the other two treatments planted in 5 replicated blocks.

Samples for leaf analysis had been taken in the Quincy orchard in September, 1949, and were taken again in September, 1951, to check the uptake of applied elements as related to treatment. Composite leaf samples had been taken in the Monticello orchard in mid-September of 1949 and 1950.

Results and Discussion

The injury scores in the Quincy orchard are summarized in Table I, together with previous fertilization treatment and nut yields in 1950. In the same table the trees are grouped by class of injury which brings out the differences more strikingly. The potash applications were effective in reducing the injury while the phosphate applications had very little effect. There was no indication of an interaction between potash and superphosphate in extent of injury. It may be noted that the group having the most injury had the lightest crop, indicating that heavy crop yield was not a controlling factor.

In the Monticello orchard, as shown in Table II, the least injury was found in the group of trees in treatment 3, which received potash. The most injury occurred in the group receiving treatment 2, which was identical except for the omission of potash. The experimental design does not permit as satisfactory statistical evaluation as at Quincy but supports the same conclusions in every way. The possible effect of extra nitrogen in delaying dormancy and causing greater injury would seem to explain the differences

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What Shall We Eat?

By Firman E. Bear

Soils Department, Rutgers University, New Brunswick, New Jersey

SEVERAL months ago the New York Sunday *Times* carried an editorial on "We Multiply." After pointing out that the population of the United States had increased 5,672,000 since 1950, the editor went on to say that this increase was a sign of national health. "So far," he concluded, "our population is not pressing too hard on the means of subsistence."

With this everyone will agree. But I was troubled by the editor's complacency. So I wrote to him, asking whether he had "reached any decision as to the population figure at which the pressure might be greater than would be desirable." The last sentence of his reply was: "It is conceivable that we might find ways of producing food and other necessities that would permit a vast increase in population, but we have to leave that question to experts like you."

I am still disturbed, particularly about the worthy editor's "vast increase in population." Just how many people do we want in the United States? Should we let Nature take her course, and possibly even encourage her to do more along this line? Maybe so. But, in my opinion, we should instead be doing some intelligent thinking about how to keep our population within reasonable bounds. I hope it will never exceed 200,000,000 people.

This does not mean that I think this is the limit of our capacity to provide abundant supplies of good food. About a year ago I found myself saying that "the soil of this great land of ours is capable of producing food in abundance for one billion people." Later, I learned that Daniel Lee, the first professor of agriculture at the University of Georgia, had made virtually the same statement a century earlier, in the 1852-3 Report of the Commissioner of Patents. Lee said: "We have a continent for the basis of agricultural operations, embracing climates and physical and material resources, equal to the wants of a thousand millions of prosperous and happy people." Since Professor Lee's day, our food and other wants have increased, but so also has our capacity to satisfy them.

Expansion Necessary

Just how would we proceed to get ready to feed one billion people? We would have to expand our operations both horizontally and vertically. We would have to farm farther up the hillsides, farther toward the desert, and farther into the swamps. We would have to reclaim land from the sea about our shores. Flood waters would have to be stored upstream for release as needed. Additional water would have to be milked from the clouds. Erosion would have to be brought under virtually complete control. Much larger quantities of nitrogen would have to be captured from the air. Tremendous tonnages of liming materials and fertilizers would have to be applied. Much more attention would have to be given to controlling trace-element deficiencies, which become ever more serious as yields are raised to higher levels. All animal and human wastes would have to be saved for use on the soil. The ocean would have to be tapped for water and mineral elements, and for more of its food resources.

Meanwhile, fundamental changes in

our food habits would, of necessity, have taken place. We would have become accustomed to eating much more bread, potatoes, rice, grits, soybeans, and vegetables, and much less meat, eggs, and milk. Even so, it would not be surprising if many millions of our poorer people would have to go to bed hungry every night, as they do now over vast areas in the Orient.

If the curve of population growth flattens out at about 200,000,000 people, the food problem can be readily solved. We are now harvesting crops from about 360 million acres of land. Some 20 million more acres can be added by irrigation. Probably another 20 million acres can be reclaimed from swamps without undue expense. And, when conditions require it, large additional acreages of marginal land can be brought into crop production by bulldozing, bushwacking, contouring, and stripcropping, and by a variety of other means. It seems probable that, if the need arises, we can increase our area of cropped land to around 500 million acres.

To Raise Yields

For the moment, our greatest opportunity lies in vertical expansion—in stepping up acre yields on the better land that is already being cropped. And it must be kept in mind that there are large acreages of improvable grazing land that lie outside of what is known as "cropland." To raise yields, whether on cropland or pastures, calls for the use of improved hybrids and strains of plants, better control of insects, diseases, and weeds, better systems of land management, and increased use of soil amendments.

At this point I want to call special attention to the troublesome problem of overcoming the serious need for nitrogen of virtually every acre of land that lies between the Atlantic and the Pacific Oceans. This applies not only to the cropped land but, and even more so, to the grasslands. Large acreages of our grazed lands need to be freed of brush and to be reseeded to improved grasses. These grasses need to be regularly fed with phosphate and nitrogen. In the more humid areas, where clovers can be made to supply part of the nitrogen, limestone and potash also are required. But a surprisingly large part of even our mixed grass and clover swards respond to the use of heavy doses of extra nitrogen. And virtually all intensively and extensively grazed grasslands, whether they are located in the humid regions or the semi-humid-arid regions, show phenomenal response to fertilizer nitrogen.

It is now quite well established that, if other limiting factors, including moisture, are largely eliminated, each pound of extra nitrogen, up to as much as 400 pounds an acre annually, can be expected to add from 40 to 50 pounds dry weight of grass. In the drier regions, dry-weight increases may be less than this, but the reduction will be compensated for by a higher content of protein. On the corn crop, each extra pound of nitrogen, up to 100 pounds an acre, can be expected to give one-third to one-half bushel of grain. For wheat and other small grains, each extra pound of nitrogen, up to 50 pounds an acre, will yield an extra 15 to 20 pounds of grain.

Such increases for nitrogen applications apply much farther west and southwest than most people realize. Much of the drouth damage to grass crops, including corn, grain sorghums, and small grains, as well as pasture grasses, is due to nitrogen deficiency. When the plow depth or more of soil dries out thoroughly, bacterial processes virtually cease, and very little organic-matter nitrogen is made available for crop use. At this point fertilizer nitrogen comes into play, as long as plant roots have water at their disposal in the lower soil horizons.

Phenomenal effects from clovers are frequently noted when they are liberally fertilized with phosphate and potash and grown in association with grass on nitrogen-starved land. Under such conditions some of the nitrogen

that is fixed by the nodule bacteria escapes into the surrounding soil, with the result that the grass turns dark green and grows luxuriantly. Such effects are especially noticeable in the more humid Coastal Plain regions of the Southern States. Often scattered crimson clover plants are surrounded by spots of luxuriant green grass similar to those noted where animals have urinated.

But it must be kept in mind that there are vast areas of grazing land in the United States where legumes are entirely absent from the sward. Where does the grass in these areas get its nitrogen? It gets a little by way of the limited amount of rain that falls. A little more is supplied by the nonsymbiotic nitrogen-fixing bacteria, which feed on the organic matter that is left in the soil by grass roots. The grazing animals return, through their urine and feces, about 75 per cent of the nitrogen they consume. And every point at which they stop to urinate is plainly marked. In other words, the whole grassland area, from the Great Plains westward, is being operated under conditions of nitrogen starvation. This means both low yields of grass and low protein values.

Other Fields of Research

A soils man like myself, whose primary concern is with the soil, and the means by which its productivity can be increased, is quite likely to overlook possible developments in other fields of research, as applied to agriculture, that have great added importance. Some of these merit special mention. Thus only a few of the possibilities in breeding plants and animals for increased yield potentialities have, so far, been realized. But sufficient work has been done with hybrid corn and hybrid hogs to enable us to see what can be accomplished by this type of research. The introduction of antibiotics into feeds has resulted in greatly increased efficiency in pig and poultry production. And, no doubt, much more can be accomplished in this field of study. There is reason to believe that antibiotics may have great supplemental value in controlling plant diseases. Tremendous advances have been made in the development of organic insecticides, fungicides, and weedicides. They are now being applied even to such large-acreage crops as corn and small grains. Recent developments in machinery permit much less costly and more effective land-clearing, land-management, and cropping procedures.

At this point it may be well to remind ourselves that we are interested not only in the quantity of food at our disposal, but in the quality of the food we eat as well. If we found it necessary to live largely on grain itself rather than on the animal products that can be produced by feeding it to livestock, we could meet minimum needs of many more millions of people. But we are accustomed to meat, eggs, and milk, in abundance. And our whole food-producing and food-processing economy is built on the assumption that we shall be permitted to enjoy these high-protein quality foods in abundance. In other words, we have heavy investments in equipment and buildings for livestock farming, we have enormous processing plants for livestock products, we have trains of refrigerator cars and fleets of refrigerated trucks for their transportation, we have well-developed inspection services for quality control, and virtually every household is equipped with a refrigerator, often with a quick-freeze unit, in which these highly perishable products are being stored. It does not seem likely that we shall soon be willing to give up these quality foods. And there seems little reason to believe that we shall have to do so in any very near future.

Apart from our desires for and benefits from high-quality animal-protein foods, there are highly important reasons for an animal agriculture. It permits of storing large reserves of food and of soil fertility that can be consumed in case of necessity, as in time of widespread drouth or war, or of

both, should they ever occur at the same time. It is my considered opinion that we would do well also to develop large forest reserves for food-storage purposes. And we should have a national research program designed to improve our knowledge of how to transform wood into yeast proteins. Should a serious food shortage ever develop, either temporarily or permanently, we would then be prepared to proceed to put this process into operation.

The final answer to the problem of producing much larger amounts of food will be found in the use of much greater amounts of the vast untapped supplies of energy that surround us. At the moment we are depending primarily on stored energy derived from the sun. These energy resources consist mostly of coal, petroleum, natural gas, oil shales and tar sands. Over 95 per cent of the known reserves of these materials is still available for use.

New Developments

But rapid strides are being made in the development of atomic energy. Engines are being designed for converting the rays of the desert sun into mechanical energy. And there is great hope that the secret of photosynthesis by green plants can be unlocked. Recently a meeting was held in New York City to discuss chlorophyll and its close relative, chlorophyllin, the widely advertised deodorant. In a report of this meeting in the December 15, 1952, issue of *Chemical and Engineering News* one finds this statement: "It does not require too great an imagination to conceive that, once we are able to understand the key features of photosynthesis, we shall be able to use not merely the 1 to 3 per cent of the sunlight that plants use, but much more of this energy. We shall be able to make pigments that can absorb all portions of the sun's spectrum with great efficiency. We may then be able to produce electrons having potentials even greater than those of the hydrogen electrode. The energy of the sunlight could then supply us with unlimited amounts of pure hydrogen and oxygen for heat and for synthetic chemical transformations. Then surely we would have harnessed the sun for the betterment of mankind."

But, in closing this, I would remind you that most of the world's wars and related problems have arisen because of hunger, or the fear of it. The Four Horsemen of the Apocalypse—War, Famine, Pestilence, and Death—still stand by, ready to destroy us. The 36 billion acres of land on this planet would appear to be adequate for feeding several times the 2½ billion people who inhabit it. But the greater part of this land is too cold, too wet and hot, too dry, or too rough to be of any great use for agriculture, at least until much larger energy resources than we now have are at our disposal.

We are indeed fortunate that about one fourth of the 1,903,000,000 acres of land in continental United States is capable of being cropped. We can feed many more people than we now have in this country, and we can feed them well. But present population growth in the United States is at the rate of 1.7 per cent a year. Of the 25 million world increase in population yearly, the United States is contributing 10 per cent.

As the editor of the *New York Times* said, "Population increases are, within limits, a sign of national health. It would be unscientific to say that babies are born in the United States because they like it here, but somehow one gets that feeling about it. This is a good place to live and an increasing number of people are living here."

Yes, all this is true. And we can feed them, and feed them well—up to a point. But if we are as intelligent a people as we think we are, we will not tempt Fate by encouraging population growth to the point that it gets out of hand. I think we can feed one billion people, and feed them well, if we have to do it. But I also think that 200,000,000 is enough for this country.

Fig. 1. Not so temperamental as peanuts, soybeans respond to applications of potash. They do best, however, when the soil has been properly limed. The above picture shows an eastern Carolina soybean field which has had the two materials applied to the soil. Note the tremendous production of forage. The beans are used in North Carolina as a late summer grazing crop for livestock, for hay, for silage, and for seed. Eastern Carolina is regarded a natural home for soybean production. (Photo by John Mattox.)

It Takes a Wise Man

By F. H. Jeter

North Carolina State College, Raleigh, North Carolina

P. E. PARKER, JR., works in a peanut-growing county. He has a trained mind, but he is of the opinion that it takes more than a trained mind to be sure of what may happen with a crop of peanuts. Last year, for instance, growers in one part of Hertford County, where Mr. Parker works as an assistant farm agent, harvested yields of around 30 bags to the acre, while growers in another part of the same county "picked" only 12 to 15 bags an acre. The exasperated Mr. Parker asserted that if Socrates were here to philosophize in this modern day, the learned Greek would make an observation something like this: "Unless you are anxious to fool yourself, never attempt to estimate your peanut crop until the last acre has been threshed."

In fact, it is only recently that anyone in authority would attempt to give definite information about growing the crop. North Carolina is developing two new varieties, known for the present as No. 1 and No. 2. The two varieties have a higher quality meat content than some of the old farmer stock

and sold for $3 more per bag last season. They outyielded the old Adkin Runner and Virginia Bunch by three to four bags an acre right along.

This temperamental crop responds to various treatments one year and fails to respond another year. Almost always, however, proper dusting with the copper-sulphur dusts during the growing season will control leafspot, add to the yield, provide a better hay, and make for a better all-around crop. Perhaps the main problem connected with growing the crop, however, is with fertilization. It's the third most valuable cash crop in the State. In 1953, the growers planted 175,000 acres that sold for over $20 million. But the trouble is, the average acre yield of peanuts remains where it was 40 years ago, while that of other cash crops has gradually climbed.

The North Carolina Experiment Station has been conducting some careful research with peanuts for the last few years and expects soon to have facts available that will help the grower out of his old hit-or-miss methods. In fact, enough information has been gathered to permit the departments of agronomy, agricultural engineering, entomology, and plant pathology to issue Extension Circular 257 as a "Peanut Production Guide." The authors recognize in this guide that among the main factors affecting the peanut yield, nothing is more important than fertilization. The principal problem here is supplying enough potash and calcium. Other fertilizing materials seldom increase the yield if peanuts are grown in rotation with such well-fertilized crops as corn or cotton.

According to the research folks, peanuts have the reputation of being hard on the land. But where diseases and nematodes are controlled, this harmful effect is mainly the result of the peanut plants removing huge amounts of potash from the soil. The State Soil Testing Laboratory reports that two thirds of all soil samples sent in from the nine principal peanut-growing counties of

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Fig. 2. The soybean plant seen above illustrates the results of proper breeding and good fertilizing. The picture shows a variety being bred at the McCullers Branch Station of the North Carolina Agricultural Experiment Station. If the selection continues to give promise, it may be released as a new variety within the next two years. (Photo by John Mattox.)

Response of New Wheat Varieties to Fertilizers in Pocket Area

By H. R. Lathrope

Agronomy Department, Purdue University, Lafayette, Indiana

WHEAT in the Pocket Area responds well to fertilizers. Probably 90% of the wheat fields in this area (8 counties in southwestern Indiana—Daviess, Gibson, Knox, Pike, Posey, Sullivan, Vanderburgh, and Warrick) would suffer greatly from the lack of plant food if it were not added to the soil for each year's crop.

Wheat plants are not 100% efficient in extracting nutrients from the soil, and it becomes necessary to supply to the soil each year more plant food than the crop removes. The approximate amount of plant food or fertilizers to be added for maximum results depends, or course, on how much plant food there is available in the soil. Soil tests are the best means of accurately determining the pH and the approximate amounts of phosphorus and potash in the soil which are extractable by plants. Tissue tests provide excellent diagnostic information on the growing plants. Corn is the best indicator crop in this area, and many farmers observe the conditions of their corn fields in order to determine whether their soils lack nitrogen, phosphorus, or potash. Deficiency symptoms are more easily seen in corn than in wheat.

Use of Nitrogen

Yields from approximately 200,000 acres of land seeded to wheat in this area were 15 bushels per acre in 1930 when practically no nitrogen and very little potash were used by wheat producers. In 1946, producers in the area used approximately 200 tons of nitrogen material. In 1948, for a demonstration 1,200 tons of nitrogen carriers were used by 2,000 farmers selected by their County Agricultural Agents. The

TABLE I.—SUMMARY OF SOIL TESTS—PHOSPHORUS AND POTASH (PURDUE LABORATORY TESTS) JULY 1, 1946-NOVEMBER 15, 1952

PHOSPHORUS (Read across)	POTASSIUM (Read down)						
	Very high	High	Medium	Low	Very low	Total	Per cent
Very high	3	8	4	19	14	48	8.8
High	2	8	16	32	24	82	15.1
Medium	7	4	10	27	17	65	11.1
Low	0	4	13	41	61	119	22.0
Very low	3	8	16	62	151	240	43.0
Total	15	32	59	181	267	554	100.0
Percentage	2.7	6.0	10.6	32.6	48.1		100.0

first requirement of cooperators was that they must have applied sufficient phosphorus and potash at seeding time, which was at least 500 pounds of a high phosphate and potash analysis approximating 60 pounds of each per acre.

Reports from 300 of the 2,000 producers indicated that on their field tests they received 7 bushels of wheat per acre as an increased yield due to 35 pounds of nitrogen per acre, coupled with the 60 pounds of phosphorus and 60 pounds of potash. Legumes seeded in the wheat made excellent growth on fields where nitrogen, phosphorus, and potash had been applied and where the pH of the soil was high enough to promote the production of deep tap-rooted legumes such as sweet clover and alfalfa. Many stands of legumes fail because of a lack of potash.

TABLE II.—SOIL ACIDITY TESTS—SUMMARY OF PH TESTS IN POCKET AREA (PURDUE LABORATORY TESTS) JULY 1, 1946-NOVEMBER 15, 1952

No. Samples	Per cent	pH Range
73	12.8	7.0
229	40.1	6.4–6.9
187	32.8	5.8–6.3
67	11.7	5.0–5.7
15	2.6	3.6–4.9
517	100.0	

It appears from the results of these 517 tests that approximately one half of the soils have a pH below 6.8 and hence are too acid for the efficient production of sweet clover and possibly alfalfa. Many indications point to better yields of corn and wheat with a pH of 6.7-7.0.

Farmer Experience

Fertilizer tests together with soil and tissue tests on each field and farm help producers to more accurately apply the most profitable amount of fertilizer. Wheat producers in the Pocket Area agree that seeding time is the best time to apply enough plant food to grow the highest yield of wheat possible and still leave enough phosphate and potash in the soil to grow a good crop of deep tap-rooted legumes. These legumes help to build humus in the soil and they also help to carry plant food down deep into the subsoil. Deep tap-rooted legumes provide better vertical drainage in the soil by punching holes 2 to 4 feet deep through compacted plow soil layers and tight subsoils. These legumes do not send storage roots down into acid soils. Tests at the Purdue Agronomy Farm show that corn yields were increased by 28 bushels following sweet clover.

Farmers, during the past 6 years, have observed demonstration plots on farms in each of the 8 counties and many have adopted the practices which were demonstrated to be profitable on these farms. Vigo, a new soft red winter wheat released by Purdue in 1946, is now being grown on 80 per cent of the farms in the area. Vigo has spread rapidly in Illinois, Arkansas, Missouri, Ohio, Pennsylvania, Tennessee, and Kentucky.

Robert Doades, R. R. Washington, Daviess County, applied 700 pounds of 10-10-10 when he seeded his wheat and harvested 50 bushels. He had observed the performance of wheat in the test plots in Daviess County and dedided to try the program himself. "We will use 10-10-10 exclusively from now on," was Mr. Doades' comment. Soil on his farm has a pH of about 6.5 to 6.8 and he is building organic matter into his soil each year.

Bernard Wagner, R. R. 2, Chandler, Warrick County, harvested 49 bushels of Seneca wheat from a section of his field where he applied 50 pounds of nitrogen, ammonia form (liquid), 100 pounds of phosphate, and 100 pounds of potash at seeding time. In the fall of 1953, Mr. Wagner adopted the same procedure which Mr. Doades is using and applied 70 pounds nitrogen (liquid), 70 pounds phosphorus, and 70 pounds potash at wheat seeding time.

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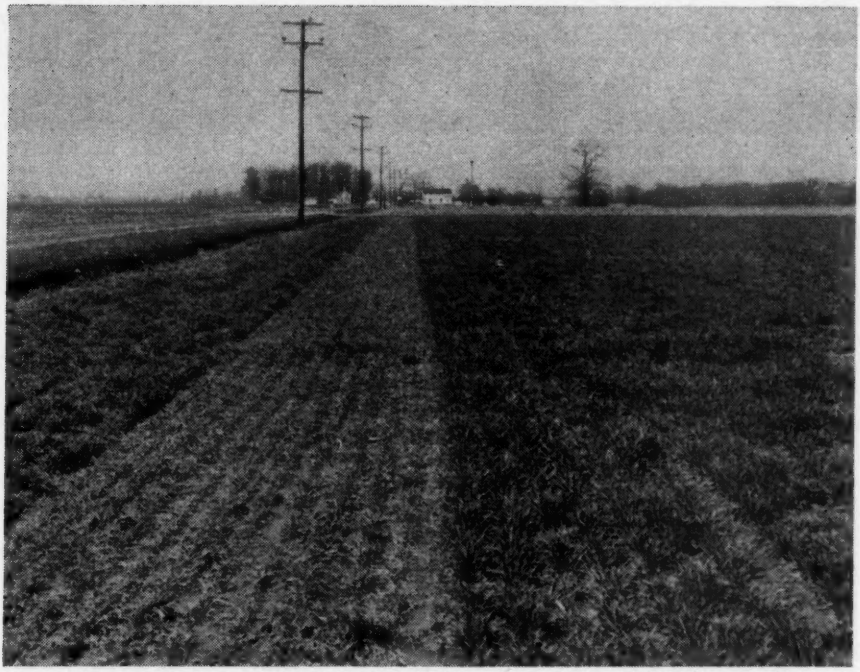
Above: Maynard Bertsch, Director WLS Farm Hour, inspects Knox, a newly released, high-yielding, short-strawed, soft red winter wheat, in full head May 1. Other varieties were 10 days later.

Below: Leroy Tade, Vincennes, Indiana, is proud of his wheat which was fertilized with 100 lbs. N, 100 P, and 100 lbs. K at seeding time and yielded 64 bu. per acre.

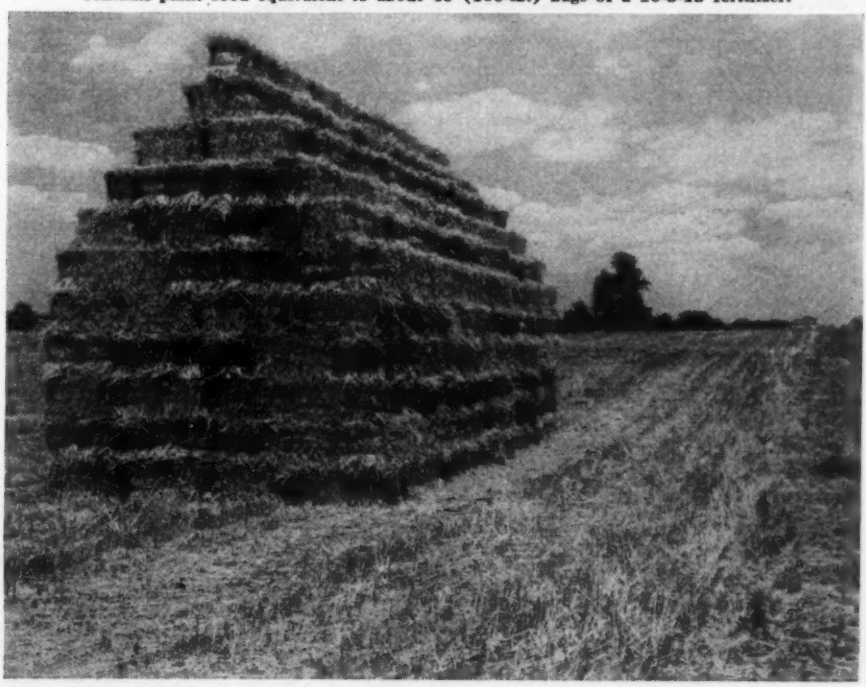


Above: The entire field except the drill width (left) received 60 lbs. N, 100 P, and 100 lbs. K at seeding time and yielded 49 bu. in 1953. The control strip yielded only 24 bu.

Below: Burning cobs or straw is a poor practice. Crop residues should be returned to the land to help feed the soil organisms or be fed to livestock to produce meat.

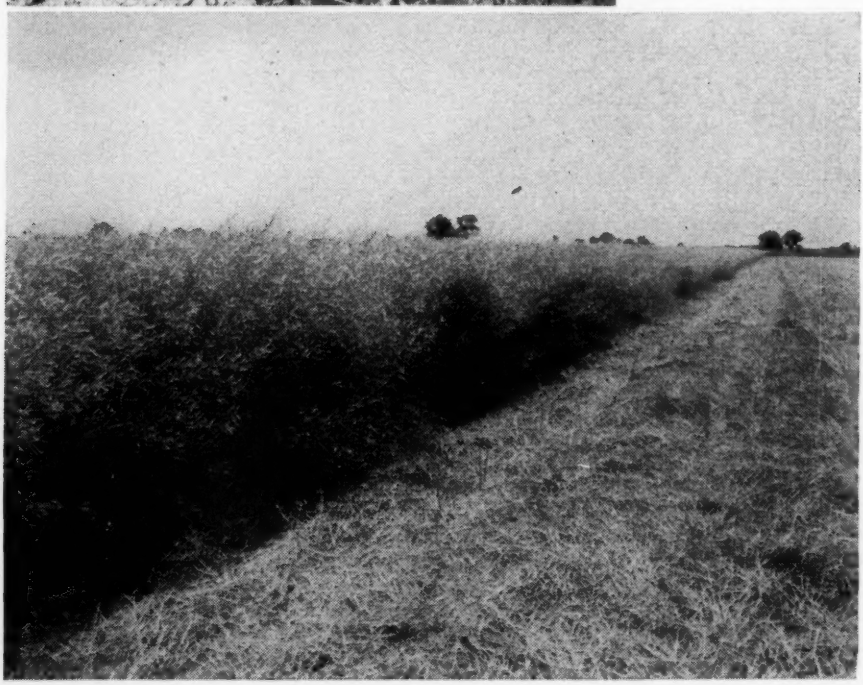
Above: Straw from a 35-bushel yield of Vigo was removed after combining to permit light to reach the legume seedlings. They probably would have been smothered had the straw not been removed.

Below: Some producers stack baled straw in the field and deliver it to straw yards later. This stack contains plant food equivalent to about 40 (100-lb.) bags of a 10-3-15 fertilizer.



Left: Chris Vieck, Vincennes, Indiana, shows root growth on alfalfa (2 years old). Alfalfa tap roots, like those of sweet clover, punch holes through plow pans, provide better aeration for soils, and help place fertilizer deep in the soil.

Below: Evergreen sweet clover, seeded in Vigo wheat in March 1952. The stand was about 4 plants per square foot and roots were ½ to ¾ inches in diameter and 3 to 4 feet long.



The Editors Talk

Our Cover Picture

The cover illustration shows a method of testing soils for available potassium when diagnosing soil and crop problems in the field. It is a very convenient procedure to test samples from the soil profile cores obtained with the sampling tubes directly under the plants on which plant tissue tests are being made.

Although this potash soil test is semi-quantitative, it is sufficiently accurate and useful: (1) to determine the relative amounts of available potassium in the top-soil and subsoil under investigation; (2) when combined with the plant tissue tests, the sufficiency of potash in applied fertilizers can be determined, and also, whether adverse physical soil conditions are affecting the absorption of potassium by the plant's roots which function only with oxygen in the root zone.

Quite often the soil tests indicate what appears to be an adequate supply of available potassium in the soil, but the tissue tests show deficient amounts in the plants. It is then that the cause of the deficiency symptoms is related to the physical soil conditions which affect the absorption of potassium by the plants. Soil crusting and compactions cause poor aeration and drainage and thereby interfere with the intake of potassium by the plant roots under these adverse soil conditions. Accordingly, a combination of soil and tissue tests is necessary to get first-hand evidence in any field for adjusting the amounts of potash fertilizers needed for subsequent crops, and also for changing the soil-management program itself. Deep tillage and the growing of well-fertilized, tap-rooted legumes in the rotation have proven to be very profitable in correcting these adverse soil physical conditions.

Interpretation of Tests

Sampler Tube to Left: This soil core was obtained in a row of second-year corn plants at the ear-stage of growth. The plants were fertilized with 150 lbs. 4-16-16 in the row at planting time and sidedressed with 100 lbs. N at last cultivation. It is a dark silt loam and the test samples were taken at the 3-inch and 10-inch levels.

By comparing the contents of Funnel Vials Nos. 1 and 2 with the TEST CHART it is seen that a *medium* test at the 3-inch and a *very low* test at the 10-inch level were obtained. Laboratory analyses on similar samples indicated *100 lbs.* and *20-40 lbs.* of available potassium, respectively. The amounts are inadequate and accounted for the typical "edge-scorch" symptoms shown by the lower leaves on the plants.

Sampler Tube to Right: This light silt loam sample was obtained in a row of third-year corn plants, also at the ear-stage of growth but in a very healthy condition. During the past three years the corn grown in this field was fertilized with over 300 lbs. of potash in 10-10-10 fertilizers.

Again compare the contents of Funnel Vials Nos. 3 and 4 with the TEST CHART. In these the tests indicate *very high* and *medium plus* amounts of

available potassium at the 3-inch and 10-inch levels, respectively. Laboratory analyses showed 460 lbs. and 140 lbs. available potash. These amounts were sufficient for the healthy growth of the plants at the time the tests were made. The tests also demonstrated that potash moves slowly downwards into the subsoil in this field.

Test Procedure

Use sampler tube to get a core of soil 12 to 14 inches deep. Slice the core lengthwise and observe any differences in texture. Allow the soil to dry and then use either the brass soil meter or aluminum teaspoon to place the equivalent of one teaspoonful into each vial. Add 10 cc. of Potash Reagent No. 1 and shake well for one minute. Filter the extract into the funnel tube and obtain 5 cc. of clear solution. With pipette add slowly 2½ cc. of Potash Reagent No. 2 and then mix quickly by pouring into a clean vial and return to funnel tube. Allow to stand about 3 minutes and then compare the turbidity of the solution with the chart. Note: Keep Reagent No. 1 cool during hot weather in the field.

Test Solutions

Reagent No. 1 is prepared as follows: Dissolve 5 grams of sodium cobaltinitrite and 30 grams of sodium nitrite in distilled water, add 5 cc. of glacial acetic acid, make to 100 cc. volume, and allow to stand for several days. Add 5 cc. of this solution to a solution of 15 grams of sodium nitrite in 100 cc. of distilled water and adjust to pH 5.0 with acetic acid. Sodium cobaltinitrite from different sources has been found to vary widely in cobalt content. The directions given here are based on the use of the "Baker's Analyzed" product. Cobaltinitrite concentration is an important factor in determining the sensitivity of the test. (Purdue Station Bul. 584, Dec. 1952).

Reagent No. 2—Isopropyl alcohol (anhydrous).

Equipment

The soil samplers can be purchased from either the Elano Corporation, Xenia, Ohio, or the Ken Standard Company, Evansville, Indiana. The latter company also manufactures the brass soil meter. All of the other supplies—calibrated vials, funnel vials, filters, pipette, test chart, and reagents are available from the Department of Agronomy, Purdue University, Lafayette, Indiana.

These tests can be very helpful to growers who want to obtain information on a growing crop, especially after they have obtained a little experience in running and interpreting the tests. The procedure should encourage them to take advantage of the official soil-testing laboratories to get more complete tests on their field crop acreages.

Progress A man-hour of farm work today turns out three times as much food grains as 40 years ago, twice as much feed grains, three-fourths more fruit and tree nuts, and about half again as much milk, poultry products, cotton, and truck crops. A man-hour of farm work today produces about 2⅓ times as much food (production) as it did in 1910. Four decades ago one person engaged in agriculture produced enough food and fiber to provide for himself and six other persons. Now he produces enough for himself and 17 other persons.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950.....	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951.....	37.9	51.1	163.0	304.0	166.0	211.0	19.50	69.30	....
1952.....	36.9	50.0	196.0	331.0	157.0	209.0	21.05	70.00	....
1953									
January.....	29.79	46.2	206.0	386.0	148.0	210.0	21.65	65.30	....
February.....	30.19	36.7	179.0	384.0	143.0	205.0	20.85	64.50	....
March.....	31.52	....	165.0	401.0	146.0	210.0	19.65	63.60	....
April.....	31.45	....	134.0	409.0	146.0	208.0	18.85	63.10	....
May.....	31.73	51.5	115.0	413.0	149.0	206.0	17.95	61.80	....
June.....	31.51	51.0	102.0	398.0	146.9	188.0	16.05	61.20	....
July.....	31.87	51.2	95.5	402.0	147.0	187.0	15.45	59.00	....
August.....	32.77	51.3	91.4	350.0	148.0	186.0	15.85	56.70	....
September...	33.09	57.6	98.9	264.0	150.0	192.0	16.15	51.50	....
October.....	32.46	52.6	89.7	233.0	134.0	194.0	16.45	52.40	....
November...	31.82	42.3	91.6	232.0	133.0	200.0	17.25	53.40	....
December....	30.73	49.2	82.5	246.0	141.0	201.0	18.25	53.00	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	207
1946.....	263	382	178	248	212	209	141	319	182
1947.....	257	380	232	248	336	259	148	381	226
1948.....	245	482	222	253	201	226	155	298	214
1949.....	231	459	184	244	193	213	139	192	201
1950.....	323	517	132	197	238	226	141	384	185
1951.....	306	512	233	346	259	239	164	307	239
1952.....	298	500	281	377	245	236	177	310	254
1953									
January.....	240	462	296	440	231	238	182	290	237
February....	243	367	257	437	223	232	176	286	237
March.....	254	...	237	457	227	238	166	282	248
April.....	254	...	192	466	227	235	159	280	204
May.....	256	515	165	470	232	233	151	274	182
June.....	254	510	146	453	227	213	138	271	270
July.....	257	512	137	458	229	212	130	262	216
August.....	264	513	131	399	231	210	134	251	221
September...	267	576	142	301	234	217	136	228	159
October.....	262	526	129	265	209	219	139	232	175
November...	257	423	131	264	207	226	145	237	186
December....	248	492	118	280	220	227	154	235	195

Wholesale Prices of Ammoniates **

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952	3.34	2.09	13.95	11.27	9.72	.....
1953						
January	3.34	2.28	13.25	11.24	8.43	8.05
February	3.34	2.28	13.21	11.24	7.75	7.28
March	3.34	2.28	12.69	11.24	7.16	6.56
April	3.34	2.28	11.75	11.24	6.07	6.00
May	3.34	2.28	10.34	11.24	6.23	6.14
June	3.34	2.28	10.61	11.26	6.62	6.31
July	3.34	2.28	10.34	11.15	6.75	6.14
August	3.34	2.28	10.14	10.95	7.53	6.68
September	3.09	2.28	9.82	11.04	7.51	6.91
October	3.09	2.25	9.73	11.24	7.96	7.75
November	3.09	2.22	9.61	11.24	8.19	8.19
December	3.09	2.22	9.57	11.24	8.50	9.03
Index Numbers (1910-14 = 100)						
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952	125	74	399	319	288	...
1953						
January	125	80	379	318	250	229
February	125	80	378	318	230	207
March	125	80	363	318	212	186
April	125	80	336	318	180	170
May	125	80	295	318	185	174
June	125	80	303	319	196	179
July	125	80	295	316	200	174
August	125	80	290	310	223	190
September	115	80	281	313	223	196
October	115	79	278	318	236	220
November	115	78	275	318	243	233
December	115	78	273	318	252	257

Wholesale Prices of Phosphates and Potash **

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports [2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports [2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports [2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports [2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952	.849	3.98	5.47	.401	.793	15.25	.200
1953							
January	.860	3.98	5.47	.430	.827	16.00	.210
February	.860	3.98	5.47	.430	.827	16.00	.210
March	.860	4.22	5.47	.430	.827	16.00	.210
April	.860	4.28	....	.430	.827	16.00	.210
May	.860	4.28	....	.430	.827	16.00	.210
June	.860	4.28	....	.361	.708	13.44	.176
July	.895	4.28	....	.396	.768	14.72	.193
August	.895	....	....	.396	.768	14.72	.193
September	.895	....	....	.396	.768	14.72	.193
October	.895	....	....	.396	.768	14.72	.193
November	.895	....	....	.396	.768	14.72	.193
December	.895	....	....	.430	.827	16.00	.210
			Index Numbers (1910-14 = 100)				
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952	158	110	112	72	83	63	83
1953							
January	160	110	112	76	87	66	85
February	160	110	112	76	87	66	85
March	160	117	112	76	87	66	85
April	160	119	...	76	87	66	85
May	160	119	...	76	87	66	85
June	160	119	...	66	74	56	80
July	167	119	...	71	81	61	82
August	167	...	...	71	81	61	82
September	167	...	...	71	81	61	82
October	167	...	...	71	81	61	82
November	167	...	...	71	81	61	82
December	167	...	...	76	87	66	85

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and all Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1927	141	148	139	116	89	150	100	94
1928	149	152	141	121	87	177	108	97
1929	148	150	139	114	79	146	114	97
1930	125	140	126	105	72	131	101	99
1931	87	119	107	83	62	83	90	99
1932	65	102	95	71	46	48	85	99
1933	70	104	96	70	45	71	81	95
1934	90	118	109	72	47	90	91	72
1935	109	123	117	70	45	97	92	63
1936	114	123	118	73	47	107	89	69
1937	122	130	126	81	50	129	95	75
1938	97	122	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	123	130	127	86	56	130	102	77
1942	158	149	144	93	57	161	112	77
1943	192	165	151	94	57	160	117	77
1944	196	174	152	96	57	174	120	76
1945	206	180	154	97	57	175	121	76
1946	234	197	177	107	62	240	125	75
1947	275	231	222	130	74	362	139	72
1948	285	250	241	134	89	314	143	70
1949	249	240	226	137	99	319	144	70
1950	256	246	232	132	89	314	142	72
1951	302	271	258	139	93	331	152	76
1952	288	273	251	144	98	333	158	76
1953								
January	267	267	246	144	102	307	160	80
February	263	264	246	142	102	296	160	80
March	264	265	248	141	102	282	160	80
April	259	264	246	139	102	256	160	80
May	261	264	247	137	102	245	160	80
June	259	260	246	135	102	253	160	70
July	259	261	248	138	102	252	167	75
August	258	262	249	139	102	261	167	75
September	256	259	249	137	97	258	167	75
October	250	258	247	137	96	265	167	75
November	249	259	247	137	96	267	167	75
December	252	260	247	139	96	271	167	80

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only; manure salts since June 1941, other carriers since June 1947.

**** Where range of prices for fertilizer material is quoted, average figure is used. The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. The maximum discount is now 16%. Applied to muriate of potash, a price slightly above $.353 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Annual Reports on Commercial Feeds, Commercial Fertilizers and Agricultural Seed Inspections, 1952," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 485, Dec. 1952, A. R. Anderson, L. H. Johnson, R. C. Wetherell, Jr., and D. J. Davis.

"Fertilizer Consumption Trends in New Mexico," Agr. Exp. Sta., N. Mex. A&M College, State College, N. Mex., Press Bul. 1086, Aug. 1953, H. E. Dregne.

"Superphosphate vs. Raw Rock Phosphate," Agr. Exp. Sta., Wooster, Ohio, Agronomy Dept. Series #129, E. E. Barnes.

"What About Liquid Fertilizers, Minor Elements and Nitrogen on Corn," Agr. Exp. Sta., Wooster, Ohio, Agronomy Dept. Series #130, H. J. Mederski.

"Commercial Fertilizers—1953-54," State Dept. of Agr., Madison, Wis., Bul. 321, Sept.-Oct. 1953, W. B. Griem.

"The Fertilizer Situation for 1953-1954," Commodity Stabilization Service, USDA, Washington, D. C., Nov. 1953.

Soils

"Conserve Our Soil, Forest, and Wildlife," Agr. Ext. Serv., Univ. of Conn., Storrs, Conn., Bul. 447, June 1953.

"Soil Moisture Relations in the Coastal Citrus Areas of Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 526, Sept. 1953, T. W. Young.

"Nutritional Condition of Michigan Orchards: A Survey of Soil Analyses and Leaf Composition," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Tech. Bul. 237, June 1953, A. L. Kenworthy.

"Soil Conservation and Management on Sandy Farm Land in Northeast Nebraska," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Bul. 420, May 1953, F. L. Duley, J. C. Russel, T. H. Goodding, and R. L. Fox.

"Land Appreciation Training Schools and Judging Contests in Oklahoma," Ext. Div., Stillwater, Okla., Cir. 598, E. Roberts.

"Summary of Soil and Water Conservation and Management Research at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma, 1953," Agr. Exp. Sta., Okla. A&M College, Stillwater, Okla., Mimeo. Cir. M-245, May, 1953.

"Contour-Furrow Irrigation," SCS, USDA, Wash., D. C., Lflt. 342, Sept. 1953, K. O. Kohler, Jr.

"Farm Planners' Engineering Handbook for the Upper Mississippi Region," SCS, Regional Office, Milwaukee, Wis., Agr. Handbook No. 57, June 1953.

Crops

"Fruits and Nuts for Home Use," Agr. Ext. Serv., Ala. Polytechnic Institute, Auburn, Ala., Cir. 446, Feb. 1953, J. Bagby.

"Breeding Cottons Resistant to Bacterial Blight Disease," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 534, May 1953, C. A. Moosberg.

"Peanut Performance Tests, 1944-1952," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Rpt. Series 39, Sept. 1953, J. O. York and W. J. Wiser.

"Strawberries, Culture, Diseases, Insects," Agr. Exp. Sta., Colo. A&M College, Fort Collins, Colo., Bul. 428-A, May 1953, C. M. Drage and W. J. Henderson.

"Agronomic Studies of Ramie in the Florida Everglades," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 525, Sept. 1953, C. C. Seale, E. O. Gangstad, and J. F. Joyner.

"Value of Pearl Millet Pasture for Dairy Cattle," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 527, Oct. 1953, S. P. Marshall, A. B. Sanchez, H. L. Somers, and P. T. D. Arnold.

"Growing and Marketing Georgia Sweet Potatoes," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Bul. 482, Rev. June 1953, W. C. Carter.

"Feather Fingergrass," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, Hawaii, Ext. Cir. 340, Oct. 1953, E. Y. Hosaka.

"Grassland Farming," Agr. Ext. Serv., Univ. of Idaho, Moscow, Idaho, Ext. Bul. 195, June 1953, L. E. Spence.

"Extension Service Programs that Assist People in Solving Their Own Problems," Agr.

Ext. Serv., Kans. State College, Manhattan, Kans., 1952 Annual Report, June 1953.

"Annual Report 1952," Northeast Louisiana Exp. Sta., St. Joseph, La.

"Extension Reports Busy Year," Agr. Ext. Serv., Univ. of Me., Orono, Me., Ext. Bul. 432, Sept. 1953.

"How to Grow Kennebecs," Agr. Ext. Serv., Univ. of Me., Orono, Me., Ext. Cir. 273, Apr. 1952, O. L. Wyman.

"Pasture Mixtures for Beef Production," Agr. Exp. Sta., Univ. of Md., College Park, Md., Bul. 444, June 1953, A. W. Burger and J. E. Foster.

"66th Annual Report, Fiscal Year Ending June 30, 1953," Agr. Exp. Sta., Miss. State College, State College, Miss.

"Missouri Farm People Move Ahead, Annual Report, 1951," Agr. Ext. Serv., Univ. of Mo., Columbia, Mo., Cir. 622, May 1952, J. W. Burch.

"Nebraska Corn Performance Tests, 1953," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Outstate Test. Cir. 33, Nov. 1953, A. F. Dreier, J. H. Lonnquist, D. P. McGill, and P. L. Ehlers.

"Performance of Soybean Varieties in Nebraska, 1948-1953," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Outstate Test. Cir. 34, Dec. 1953, D. G. Hanway and A. F. Dreier.

"Thirty-seventh Annual Report of the New Jersey State Department of Agriculture, July 1, 1951—June 30, 1952," State Dept. of Agr., Trenton, N. J., June 1952.

"Narcissus in the Garden," Agr. Exp. Sta., State Univ. of N. J., New Brunswick, N. J., Cir. 554, Aug. 1953, H. M. Biekart.

"Your Extension Service Reports," Agr. Ext. Serv., New Mexico A&M College, State College, N. Mex., Biennial Rpt., Jan. 1953.

"Peony Culture," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Cornell Ext. Bul. 893, June 1953, R. E. Lee.

"Ohio Soft Winter Wheat Tests Including Results of 1952," Agr. Exp. Sta., Wooster, Ohio, Agronomy Dept. Series No. 128, Dec. 1952, C. A. Lamb.

"Ohio Soft Winter Wheat Tests, Results from 1953, Summary to Date," Agr. Exp. Sta., Wooster, Ohio, Agronomy Dept. Series No. 131, Sept. 1953, C. A. Lamb.

"Crops to Plant on Diverted Wheat Areas," Ext. Div., Okla. A&M College, Stillwater, Okla., W. Chaffin.

"Agricultural Progress in South Carolina Balancing a Changing Agriculture 1952," Annual Report 1952, Agr. Ext. Serv., Clemson Agr. College, Clemson, S. C.

"Sweet Potato Plant Production," Agr. Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 268, Rev. June 1953, H. A. Bowers, W. C. Nettles, and J. A. Berly.

"Small Grain Variety Tests at the Blackland Experiment Station, 1949-52," Agr. Exp. Sta., Texas A&M College, College Station, Texas, Prog. Rpt. 1503, Oct. 16, 1952, J. W. Collier and I. M. Atkins.

"Cotton Defoliation Tests Near College Station, 1952," Agr. Exp. Sta., Texas A&M College, College Station, Texas, Prog. Rpt. 1549, Feb. 23, 1953, W. C. Hall and H. C. Lane.

"Bermuda As A Pasture Grass," Agr. Exp. Sta., Texas A&M College, College Station, Texas, Prog. Rpt. 1551, March 1953, D. I. Dudley.

"What's New in Farm Science," Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Bul. 509, June 1953, R. Powers and R. J. Muckenhirn.

"Agricultural Extension in Wisconsin, Report for 1952," Agr. Ext. Serv., Univ. of Wis., Madison, Wis., Cir. 460, June 1953.

"Increasing Forage Yields and Sheep Production on Intermountain Winter Ranges," Forest Service, USDA, Wash., D. C., Cir. 925, Sept. 1953, S. S. Hutchings and G. Stewart.

"Grazing Longleaf-Slash Pine Forests," Forest Service, USDA, Wash., D. C., Cir. 928, Nov. 1953, W. O. Shepherd, B. L. Southwell, and J. W. Stevenson.

Economics

"Present and Potential Agricultural Areas in Alaska," Agr. Exp. Sta., Univ. of Alaska, Palmer, Alaska, Bul. 15, Feb. 1953, H. A. Johnson.

"Influence of Organization and Production Practices on Income of Delaware Vegetable Farms," Agr. Exp. Sta., Univ. of Del., Newark, Del., Bul. 296, June 1953, W. E. McDaniel.

"Agricultural Activities of Industrial Workers and Retirees," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 528, Oct. 1953, D. E. Alleger.

"Ownership and Value of Farms, Newfane-Olcott Survey, Niagara County, New York," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., A. E. 918, Aug. 1953, G. P. Scoville.

"Ohio Agricultural Statistics 1951 and 1952," Agr. Exp. Sta., Wooster, Ohio, Res. Bul. 735, Nov. 1953, E. R. Westcott.

"An Analysis of the Functioning of the Agricultural Extension Program Planning Committees in Puerto Rico," Agr. Exp. Sta., Univ. of Puerto Rico, Rio Piedras, Puerto Rico, E. & R. S. 21, Oct. 1952, A. E. B. Olivieri and P. B. V. Calcerrada.

"The United States Sugar Program," PMA, USDA, Wash., D. C., Agr. Inf. Bul. No. 111, July 1953.

"The Balance Sheet of Agriculture 1953," Bur. of Agr. Econ., USDA, Wash., D. C., Agr. Inf. Bul. No. 115, Sept. 1953, F. L. Garlock, L. A. Jones, R. W. Bierman, and W. H. Scofield.

"Farm Costs and Returns. 1952 (With Comparisons) 20 Types of Commercial Family-Operated Farms in 12 Major Farming Regions," Bur. of Agr. Econ., USDA, Wash., D. C., Agr. Inf. Bul. No. 116, Aug. 1953, W. D. Goodsell, J. Vermeer, W. H. Brown, H. C. Fowler, E. Hole, E. B. Hurd, and I. Jenkins.

"Part-Time Farming," Bur. of Agr. Econ., USDA, Wash., D. C., Farmer's Bul. 1966, Rev. 1953, O. J. Scoville and K. A. Smith.

"Supplement for 1953 to Statistics on Cotton and Related Data," Bur. of Agr. Econ., USDA, Wash., D. C., Stat. Bul. 99, July 1953.

"Agricultural Outlook Charts 1954, Bur. of Agr. Econ., USDA, Wash., D. C., Oct. 1953.

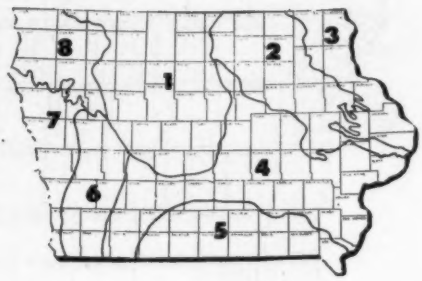
Soil Test Summaries Can Be of Value . . .

(*From page* 16)

obtain a single value for each nutrient. To do this Parker et al. (3) introduced the nutrient concept. The percentage of samples in each of five classes from very low to very high is multiplied by 1, 2, 3, 4, and 5 respectively. The sum of the figures thus obtained is divided by 100 and gives the index or weighted average. The index permits a ready comparison of the counties in a state as shown in the publication of Parker et al. Past management and the type of soil will be reflected in the nutrient index. In North Carolina where commercial fertilizers have been used for many years, past management is clearly indicated by a nutrient index map of the State (1). The phosphorus levels can be related to the distribution of tobacco, cotton, and truck crops and past use of fertilizers. The content of potassium in the soils is more closely related to soil association than to past fertilization. The sandy soils of the Coastal Plains are lower in available potassium and more acid than soils of the Piedmont or Mountain regions.

The use of commercial fertilizers is a relatively new practice in Iowa. In 1940 only a little over 15,000 tons of commercial fertilizer were used, but 10 years later the quantity had increased to more than 300,000 tons annually. Past management does not have as great an influence on the nutrient index map as in North Carolina. The nutrient index maps of Iowa follow the soil association areas remarkably closely, as shown in the accompanying figures. This is truer of potassium and acidity than phosphorus.

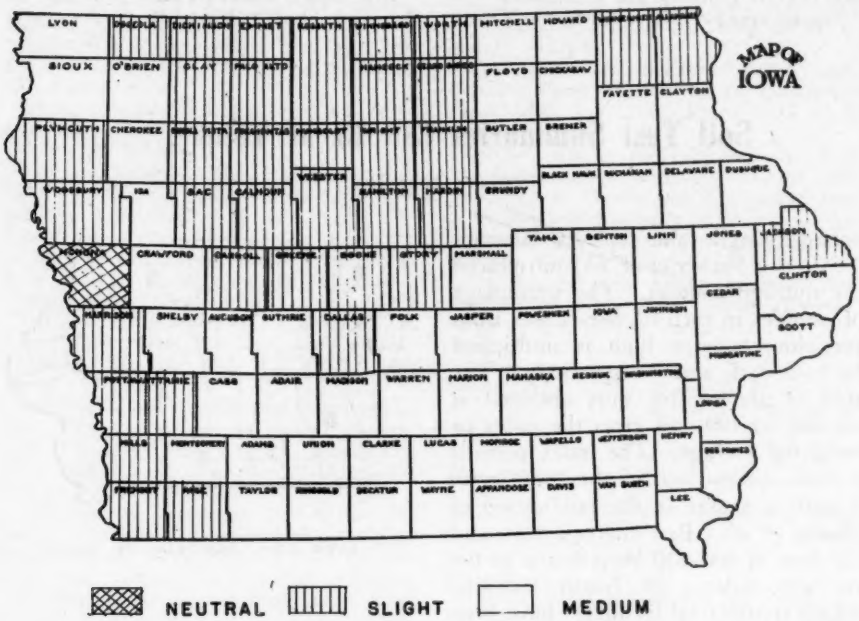
The nutrient index maps should be used only to compare the percentage of samples tested that is low or high in an element from one area to another. They should not be interpreted as meaning all samples in an area are lower or higher than those in another area or that all samples in an area are low in an element or high in an element.



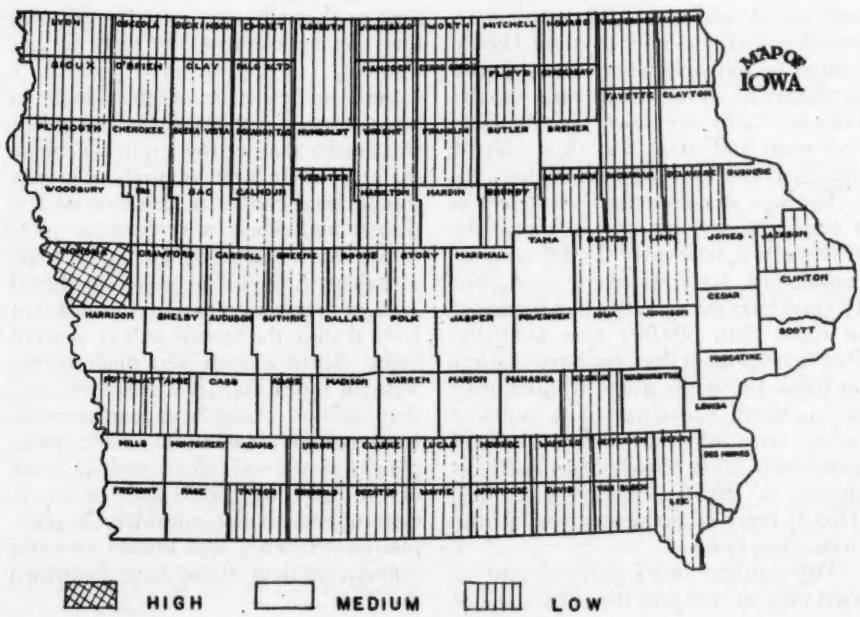
IOWA SOIL ASSOCIATION AREAS

Such maps can be of great value in several ways. A glance at the potassium index map of Iowa quickly shows the area where large amounts of potash should be included in commercial fertilizers and where very little or none is needed. Potash deficiency is more prevalent in the older, more weathered soils of northeastern and southeastern Iowa than in the loessial soils of western Iowa. Until a study was made of the nutrient index map, it was not realized that soils of Area 8 in northwestern Iowa are as low in available phosphorus as the soils developed on some of the more weathered soils of northeastern Iowa where considerable phosphorus deficiency was known to exist. Subsequent field studies have confirmed this.

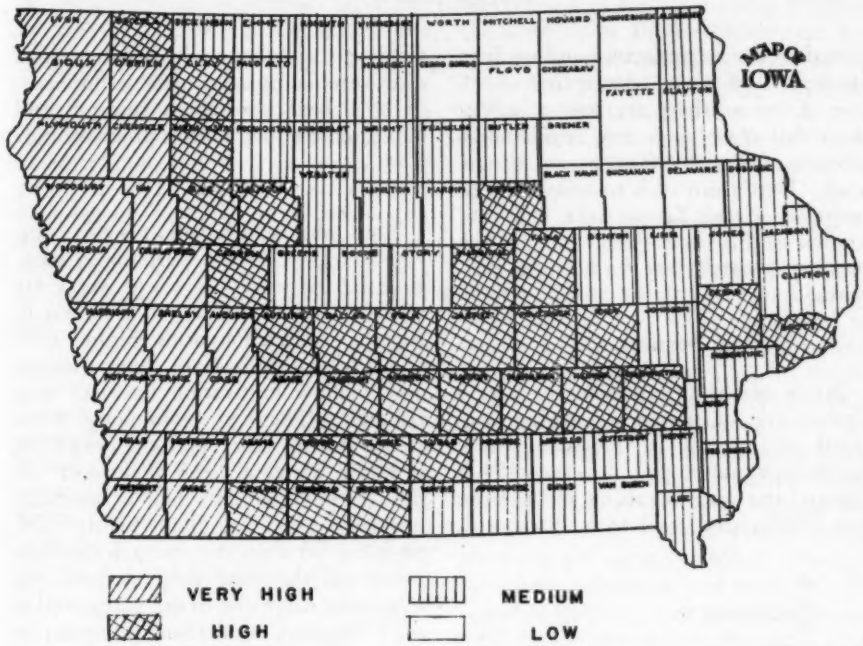
ACIDITY OF SOILS OF IOWA COUNTIES- 3/1/48 TO 2/29/52



AVAILABLE PHOSPHORUS IN SOILS OF IOWA COUNTIES- 3/1/48 TO 2/29/52



AVAILABLE POTASSIUM IN SOILS OF IOWA COUNTIES- 3/1/48 TO 2/29/52



The acidity index map of Iowa outlines soil association Areas 1 and 7 where many of the soils are neutral or slightly alkaline in reaction. Application of lime during the past 10 years is reflected in a lower lime requirement in the northeastern portion of the State. A study of the map showed a greater lime requirement in northwestern and southwestern Iowa than had been realized and emphasizes the necessity for an educational program in these areas for more liming.

Without doubt there are several other ways soil test summaries may be prepared. The illustrations presented indicate uses that can be made in educational and research programs. Commercial companies can use the results too in planning the most efficient distribution of their products. Soil tests can be a very useful tool in gaining information relative to soil-management problems.

References

1. Welch, C. D. and Nelson, W. L. Fertility status of North Carolina soils. N. C. Department of Agriculture, July, 1951.

2. McCollum, R. E., and Nelson, W. L. How accurate is a summary of soil test information.

3. Parker, F. W., Nelson, W. L., Winters, Eric, and Miles, I. E. The broad interpretation and application of soil test information. Agronomy Journal. 43:105-112, 1951.

Girl: "I've heard a man's arm is just equal to the circumference of a girl's waist."

Boy: "I'll go get a string and we'll see."

"Darling, let's have a secret love code. If you nod, I can hold your hand, if you smile, I can kiss your lips."

"Don't make me laugh."

Some Crop Potentialities . . .

(*From page* 8)

placed on disease resistance and quality; yield *per se* has not been a first objective. Even so, there are strong indications that material is now available to advance the yield frontier to a new level. Data from such material are not included in the figure since it is not known at this time whether or not the product is satisfactory for cigarette purposes.

Peanuts

Study of the peanut data in Fig. 5 reveals one of the most striking contrasts of any crop in the State. New technology developed in the 1940's pointed the way to raising yields from the 1,500-pound level to 4,500 pounds

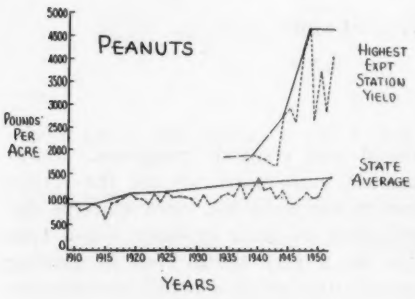


Fig. 5

per acre. A combination of developments made this possible: closer spacing, adequate calcium, high potash level, leaf spot control, southern root worm control, and new varieties. So outstanding has this development been, it will be most surprising if the State yield curve doesn't experience a sharp break within a year or two. This seems to offer one of the really promising educational opportunities in the State and with this in mind, a full-time extension specialist has recently been added to the staff. It will be an interesting story to follow in the next few years. If the expected happens, and yields go up, there will be at hand a most convincing argument on the benefit of a well-coordinated research and educational effort in crop production.

Corn

The most extensively grown cultivated crop in North Carolina is corn. Research advances in recent years are reflected in the upper curve shown in Fig. 6. Adapted hybrids, higher rates of nitrogen fertilization, closer spacing, and shallow cultivation have all contributed. The new technology developed during the period 1943-1950, bringing about a yield of around 150 bushels per acre, has had a beneficial influence upon the State yield. The time lag between the research development and the State yield increase was unusually short due to the inauguration of a vigorous educational program as soon as locally adapted hybrids were developed and other research data were available. The gap between the maximum State average yield of 37 bushels and the approximated 150 on the upper curve is still sizeable, however. It is probably unreasonable to think in terms of closing this gap as closely as in the case of some of the other crops. In many areas corn is not one of the principal crops on the farm and its production occurs on lands not especially suited to cultivated crops. Neverthe-

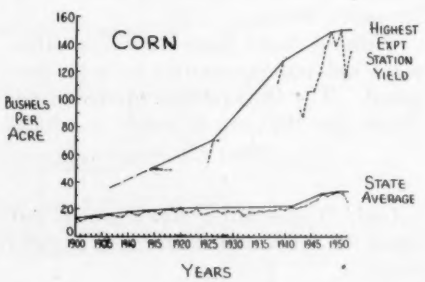


Fig. 6

less, a State average yield well above the now State high of 37 bushels may be expected with reasonable regularity as the best practices become more widely adopted.

There is an interesting contrast with corn production trends in Iowa. In that State, for example, the research advance came between the years 1920 and 1940. The "average Iowa farmer" experienced an improved production during the period 1937-41. The sharp research advance in North Carolina was in the period 1943-1950 and the average corn farmer felt it soon after 1946.

Soybeans

In many respects the soybean story is similar to that for peanuts. Fifty bushel yields are attainable yet the State average is less than 20. Current fertilizer use on this crop is estimated to be 14 pounds P_2O_5 per acre and 16 pounds K_2O. Over 60 per cent of the

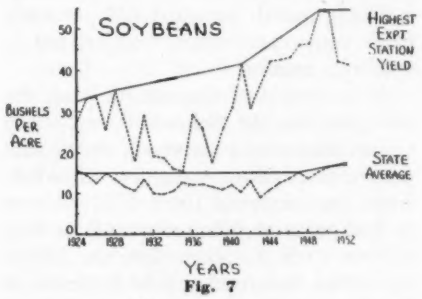


Fig. 7

soil samples the Soil Testing Division receives from fields which are to be planted to soybeans test "low" or "very low" in potash. The corresponding figure for phosphate is around 30 per cent and about 70 per cent of the soils reflect need for lime.

The introduction of Ogden, Roanoke, and Jackson varieties has contributed much to the higher yield ceilings during the late 1940's until now. In station tests, too, an adequate fertilization and liming program is followed.

Thus, it would appear that herein lies another unusual opportunity for an extensive educational program to gain adoption of the best technology now available. There has not been a sharp bend in the State curve to reflect the steep slope in the experiment station curve that started upward around 1939 or 1940. It would be interesting to know the factors that were responsible for the downward slope of the research curve during the years 1925 to 1938.

Discussion

With the exception of cotton and tobacco, the research frontiers for all crops considered in this paper, measured in terms of yield per acre, have advanced sharply in recent years. This refers especially to wheat, oats, soybeans, peanuts, and corn. In three of these the "average farmer" is experiencing benefits of this advanced production frontier—oats, wheat and corn. Though the gap is still wide there is evidence that practices, are being adopted. On the other two—soybeans and peanuts—the "average farmer" has not experienced a significant production advance. This is especially true with peanuts and to a lesser degree with soybeans. Opportunities of intensive educational efforts are indicated.

Cotton and tobacco are similar in one respect, viz., that the research frontier as measured in terms of production units per acre has reached a plateau extending in the case of tobacco for about 8 or 9 years and in the case of cotton some 12 years. In both instances research emphasis has been placed on quality factors and overcoming hazards and pests. The State curves of these two crops differ in that research advances in tobacco are reflected rather promptly to the benefit of the "average tobacco farmer." The State curve for cotton doesn't reflect a corresponding improvement in the practices for the "average cotton farmer."

It is evident that without taking into account many factors unidentified in these curves, complete interpretation is impossible. Reference is made especially to economic considerations, dis-

ease and insect hazards, maintenance of soil fertility, and crop quality. The data do serve to point out, however, that in no instance has there been any substantial increase in State average yields without an advance of still greater magnitude in the research some years before. The time interval varies widely and may be traceable in certain instances to extent of emphasis placed in the educational effort with respect to the adoption of new practices.

It is evident, throughout, that year to year fluctuations on both curves are substantial. This would suggest the advisability of research to learn how better to cope with weather hazards. In North Carolina this would mainly be a matter of learning how to cope with droughts which occur frequently.

Response of New Wheat Varieties . . .

(*From page* 26)

William Hill, Petersburg, Indiana, harvested 47 bushels per acre of an experimental fly-resistant wheat from his field which was seeded September 15, 1952, and fertilized with 100 pounds N (Sol. 32), 100 pounds P, and 100 pounds K at seeding time. In addition, Mr. Hill obtained 150 pounds of beef per acre as a result of pasturing the field during fall, winter, and spring months.

Bernard Meyer, R. R. 3, Vincennes, Indiana, harvested 31 bushels of Vigo from his field which was fertilized with 100 pounds P and 100 pounds K but increased his yield 14 bushels on the area where he topdressed with 50 pounds actual N, using Solution 32.

Harold Pirtle, Sullivan, increased his yield of wheat from 26 bushels with 200 pounds of 3-12-12 to 40 bushels when he increased his fertilizer treatment to 100 pounds N (Sol. 32), 100 pounds P, and 100 pounds K at seeding time.

Soils on the Doades, Wagner, Hill, Meyer, and Pirtle farms contain a high percentage of heavy clay and are reasonably level but have very poor internal drainage. Fall applications of nitrogen should not be used to replace spring topdressing on well-drained sandy or droughty soils.

Field Tests

The results of a Variety and Fertilizer Test Demonstration using 12 varieties of red winter wheat on the Charles Schenk Farm, Vincennes, Knox County, 1951-52 are shown in Table III. The wheat was seeded on corn ground where about 128 bushels had been grown. Two tons of cornstalks were cut and disced. Soil tests indicated that a pH of the soil was 6.6, available phosphorus high (about 160 pounds), available potash very low (80 pounds). Plots were randomized and seeded in four replications.

A summary of the results from the test plots on the Schenk Farm, using Goens wheat as a standard, shows that profits from the production of wheat could be increased from $35 per acre to $60 per acre when new college-bred wheats such as Vigo, Seneca, Saline, or Butler are used. Wheat yields in the Pocket Area, using improved varieties, can be doubled quite easily with the addition of nitrogen, phosphorus, potash, and lime. Records of the winners in the Ten-acre Wheat Improvement Contest in the area since 1946 have averaged 45 bushels per acre on 10-acre fields. The yields obtained by these contestants are three times the average area yield of 20 years ago.

Carbon-Nitrogen Ratio

Bacteria produce humus by decomposing crop residues such as wheat stubble, cornstalks, and roots which on the average contain about 40% carbon. To digest or decompose this material, soil bacteria themselves must be well

TABLE III.—VARIETY AND FERTILIZER TEST DEMONSTRATION USING 12 VARIETIES

Variety or strain	Yields fert.	Yields unfert.	Increase due to fert.	Value of increase less fert. cost	Value of wheat less costs. Net profit*
	Bus.	Bus.	Bus.		
Goens	34	19	15	$17.63	$35.38
Average of named varieties including Vigo, Seneca, Saline, Butler, Royal	43	23	20	28.88	55.63
Average of six Expt. strains	46	25	21	31.13	62.38
Average (except Goens)	44.5	24	20.5	30.00	59.00

* Value of fertilized wheat less fertilizer cost of $16.12 and less production costs of $25.00 per acre.

In studying these yields and tests it should be kept in mind that they show what results were obtained on this field during the 1951-1952 season. It is difficult to find two fields on any farm which will yield exactly the same.

supplied with nitrogen and lime. These bacteria require a certain proportion of nitrogen to the amount of carbonaceous material which they decompose. The proportion for quick release is about one part of nitrogen to about 15 parts of carbon. Bacteria flourish in soils supplied with crop residues, nitrogen, and lime. Crops growing in this environment should be well nourished with a continuing supply of nitrogen. When crop residue such as straw, stalks, and stubble containing about 40% carbon is plowed down, soil bacteria are confronted with the job of digesting or decomposing this carbonaceous material and have a tremendous demand for nitrogen to feed themselves while they do their job. Small supplies of nitrogen in the soil are taken up almost immediately by soil bacteria, and the growing crop is often deprived of its nitrogen.

Many farmers in the past burned straw and stubble. When plowed under, yields the following year were depressed. They did not have nitrogen to plow under with it and help rot the plant residues. Today we know why plowed down stubble depressed the

TABLE IV.—YIELDS OF FIVE VARIETIES—SOFT RED WINTER WHEATS—FERTILIZED PLOTS IN POCKET AREA 1947-1952

Variety	1947	1948	1949	1950	1952	Average Bu.
Native variety						
Goens	34.0	25.5	37.9	39.1	34.0	34.1
College-bred						
Seneca	42.0	34.0	42.5	44.7	46.0	41.8
Vigo	36.5	46.5	46.0	41.1	42.0	41.2
Butler	36.0	30.5	41.6	45.1	44.0	39.4
Royal	36.0	47.0	39.6	45.3	43.0	42.2

yields. With this knowledge we can turn crop residues into profit. The explanation is to be found in the life processes of bacteria that live in the soil. Beneficial soil bacteria produce humus from organic matter containing nitrogen which is released and made available to crops. When small amounts of nitrogen are added to the soil, the nitrogen is used almost immediately by soil organisms and the growing crop suffers. Soil bacteria feed at the first table. Quick-growing crops will suffer from a lack of nitrogen unless and until the 1 to 15 ratio is established. When soil bacteria suffer for lack of nitrogen, the decomposing or decaying process changes, and much of the organic residues is lost from the soil as carbon dioxide gas. If the residue from a good corn crop, approximating three tons (6,000 pounds) of carbonaceous material containing 40% carbon or 2,400 pounds, is plowed down, it would require 240 pounds of actual N to bring the nitrogen-carbon ratio to 1 to 10. The wider the ratio the slower the rotting or decomposing process.

Fertilizer Purchases and Profits

Phosphorus and potash sales increased along with the purchase of about 6,000 tons of nitrogen in the Pocket Area in the spring of 1953 for topdressing purposes. Producers have realized that they are rapidly using up available supplies of phosphorus and potash in the soil, and Knox County farmers purchased approximately 45 carloads of potash to apply with their wheat at seeding time in order to insure the establishment of legumes in the spring of 1954. Fertilizer purchases in the Pocket Area have increased more rapidly than in any other section of the Midwest.

"College-bred" wheats respond well to fertilizer and offer a rapid return for the use of lime, nitrogen, phosphorus, and potash. Wheat helps to control soil erosion, provides some pasture, and returns a handsome profit to the producers when proven practices are followed. The 5,000 wheat producers operating from 200,000 acres in the Pocket Area have increased the annual per acre yield 15 bushels to 25 bushels. This increased yield of 10 bushels per acre at $2 per bushel has added tremendous new wealth to the area each year. Pocket Area wheat producers are still not yet satisfied and are striving to push their average annual yields to 30 bushels or more. The higher the yield, the more efficient the operation and the larger the returns and profits.

It Takes a Wise Man

(*From page* 24)

North Carolina were "low" or "very low" in potash.

Research further shows that where soils are low in potash, the peanut crop will respond well to 150 pounds of muriate of potash, applied broadcast over the land before planting or in bands 2 to 3 inches to the side and 1 to 2 inches below the seed at planting time. Once the potash level is brought up to anything like a reasonable point, then this level can be maintained, if larger than normal rates of potash are included in fertilizer applied to the other crops in the rotation. The research men recommend, for instance, that it is better for the grower to apply 80 pounds of potash—that's real K_2O—to a cotton crop which precedes the peanuts than it is to apply 40 pounds to the cotton and 40 pounds to the peanuts. This 80 pounds of potash is

equivalent to 160 pounds of muriate of potash or to the potash in an 800-pounds-per-acre application of a 5-10-10 fertilizer.

Good farmers in the southeastern section of North Carolina do not yield to the opinion of their brethren in the northeastern section. These latter farmers think they have the best peanut soils and the best know-how in the State. Ray Cannon of Garland, Route 1, Sampson County, has very definite ideas about this. Ray grows three acres of peanuts a year and has the crop in a three-year rotation with corn and cotton, followed by peanuts. In 1952, he applied 700 pounds per acre of a 2-12-12 fertilizer to the peanuts and at the same time applied high rates to the cotton crop which was followed by peanuts this past year, 1953. In 1952, his peanut yield was 1,700 pounds of nuts an acre. This year it was 2,500 pounds an acre. In other words, the peanuts produced about 800 pounds more nuts without any further fertilization than that given to the cotton the year before. He says now, he will always apply his potash to the crop which precedes peanuts in the rotation. He sold 68 bags for $814.80, or 12.26 cents a pound and saved seven bags for seed in 1954.

Soybeans are not so temperamental as peanuts, but the other day Joe Powell, one of North Carolina's leading farm agents, was discussing soybeans with Billy Manning. Billy lives in Edgecombe's No. 2 township and is regarded as one of the county's best farmers. He and Joe were talking about the place of soybeans in the 1954 cropping season; and, as they discussed markets, acre yields, leaf shedding and the like, Billy volunteered the remark that the use of muriate of potash as a topdresser increased his yield of soybeans by 20 per cent. He left an acre of the beans in the middle of his field with no potash topdresser and he applied 100 pounds per acre of muriate of potash on each side of the row on all the other beans in that field. When he combined the beans, he figured he got $7.50 more beans per acre for an investment of $2.75 in potash. An added advantage, he asserted, was that he left the land in better shape for a crop of peanuts, which, on his farm, would follow the soybeans.

Joe Powell assured Billy that his experience was substantiated fully by a number of fertilizer tests with soybeans in various parts of Edgecombe County. The tests show that where sufficient lime is in the soil, the response to potash is very good. In other words, Joe said, it doesn't pay to add potash to acid soils, but if the pH reading is anywhere between 5.8 and 6.2, potash pays well with soybeans.

Ernest Hayes, who farms in the Elk Park section of mountainous Yancey County, doesn't mind anyone seeing his evident enthusiasm for potash fertilization. The reason he is so happy about it is that his 1953 apple crop graded from 90 to 95 per cent No. 1 in size. "This is a different situation than existed before I began to topdress my apple trees with potash. Then only about one half of the fruit would grade U. S. No. 1." (Mr. Hayes also has been using more potash on his green beans and other truck crops and says additional application has done much for his whole farm.)

D. D. Robinson, assistant farm agent in Yancey, adds that the other orchardists in Yancey, who did not sidedress their trees with the muriate of potash did not have near the apple size produced by Mr. Hayes' trees.

One of the remarkable things about all of these improved yields secured where more potash was used is that the increased yields were made in a year when North Carolina suffered from one of the worst drouths in the history of the State. None of the yields were made the easy way. As Mr. Robinson said, "It wasn't a bed of roses," and that perhaps is the understatement of the year.

Relation of Potash and Phosphate . . .

(*From page* 18)

TABLE I.—WINTER INJURY TO MOORE PECAN TREES IN PHOSPHORUS-POTASH FERTILIZATION PLOTS, QUINCY, FLORIDA, 1950-51.

Treatment		Average score	Number trees by class of injury		Yield per tree 1950
			Light (1 or 2)	Med. to heavy (3 or 4)	
Superphosphate	0	2.60	14	16	22.8
(lbs. per year)	20	2.47	13	17	24.4
	40	2.37	18	12	20.6
L.S.D.*		N.S.	.....	.....	N.S.
Muriate of potash	0	3.03	6	24	19.0
(lbs. per year)	5	2.27	16	14	25.2
	10	2.13	23	7	23.6
L.S.D.*		.40	.....	.....	5.9

* L.S.D. refers to differences needed to be significant at odds of 19 to 1.

between treatment 1 and treatment 2.

Since the potash treatments resulted in less winter injury, an examination was made of the available leaf composition data from both orchards (see Table III).

The Quincy orchard was not sampled in 1950 due to poor foliage condition but it is logical to expect potassium at least and probably magnesium and phosphorus levels to have been somewhat lower than in 1949 due to heavier crop and the poorer foliage condition. Data for both 1949 and 1951 seasons show that trees receiving no potash in this orchard were at low levels for potassium, while treated trees had adequate amounts according to our present knowledge. Magnesium levels appeared adequate, both seasons. Phosphate levels were also adequate at least in most of those treatments receiving superphosphate applications. The apparent inverse relation of potash and phosphate applications on levels of each other has been somewhat peculiar to

TABLE II.—WINTER INJURY TO MOORE PECAN TREES—MONTICELLO, FLORIDA, 1950-51.

Annual treatment*—lbs. per tree				Average score	% of trees by class of injury		
Zinc sulfate	N	P_2O_5	K_2O		2	3	4
2	0	0	0	2.8	35	58	7
2	2	2	0	3.2	15	50	35
2	2	2	4	2.5	55	45	0

* 1941 through 1947.

TABLE III. LEAF ANALYSIS DATA FROM FERTILIZATION PLOTS. MID-SEPTEMBER SAMPLING

Orchard	Year	Treatment KCl	Treatment Phosphate	% Dry weight N	K	Ca	Mg	P
Quincy...	1949	0	0	.....	.70	1.26	.27	.178
		0	40	.....	.71	1.53	.35	.232
		10	0	.....	1.39	1.66	.24	.148
		10	40	.....	.88	1.73	.34	.156
Quincy...	1951	0	0	2.30	.48	1.33	.37	.182
		0	40	2.30	.45	1.22	.38	.218
		5	0	2.25	1.10	1.03	.28	.150
		5	40	2.33	.77	1.28	.28	.177
		10	0	2.21	1.23	1.13	.25	.136
		10	40	2.17	1.09	1.19	.28	.145
Monticello..	1949	Composite sample		2.70	.68	1.19	.40	.161
Monticello..	1950	"	"	.....	.41	1.41	.08	.127

this orchard. It may be a result of the low levels of potash generally prevailing.

Samples taken in the Monticello orchard in 1950 were lower than in 1949 for most of the elements analyzed, reflecting the effect of a very heavy crop in 1950 combined with poor foliage conditions due to scab throughout the season. Magnesium was very strikingly reduced under these conditions. The treatments were not sampled separately, but the data in Table III indicate the potassium level for the orchard generally is at what we presently consider to be a critical point. Significant yield increases in this orchard were obtained from treatment 3 over treatments 1 and 2 during the period 1942 to 1946, indicating the need for potash under such conditions.

Summary

Reduction of winter injury to Moore pecan trees resulted from potash fertilization under conditions of low potassium supply. No important relation to previous superphosphate treatment was indicated. Data on leaf composition showed that potassium in the foliage was related to treatment and to extent of injury. Foliage injury from aphids and scab and late growth maturity were factors predisposing the trees to injury.

Barley Requires Adequate Fertilization

DR. GEORGE SMITH, of the University of Missouri Soils Department, says recent experimental work indicates that the addition of adequate plant nutrients can greatly reduce the loss from winterkilling of barley. In fact, much winterkilling appears to be only winter starvation. With the use of improved varieties planted under favorable conditions, this crop has a place on many farms in the southern two thirds of the State.

Barley is a "weak feeder." It is most responsive to additions of readily available plant nutrients. Where both wheat and barley have been used as test crops, in experiments aimed, for example, to measure the availability of different phosphates, barley has shown much wider differences in response. Many failures of barley to live through the winter have been the result of a low nutrient supply in the soil at time of seeding. In these cases the plants do not develop sufficient root system and food reserves to enable them to withstand low temperatures in open winters. Barley starts growth early in the spring and unless it is well rooted plants may be "heaved out" and will perish.

Smith says a 50-bushel crop of barley requires over 60 pounds of nitrogen, 25 pounds of phosphate, and about 50 pounds of potash. Most of the nitrogen and phosphorus are eventually concentrated in the grain. Straw is high in potassium. On an unfertilized soil most of the nitrogen and a large amount of the phosphate come from the decay of soil organic matter. Since the barley crop makes most of its growth in late fall and early spring when the soil is cool, the amount of these elements released from organic matter is low. Only the most fertile soils can release sufficient nutrients for a 50-bushel yield. In experiments and on Missouri farms, yields in excess of 75 bushels per acre have been regularly produced when adequate nutrients have been provided in a fertile soil.

Barley is particularly responsive to an early, well-prepared seedbed. This early preparation not only provides moisture for quick germination, but also the fallow period permits a buildup of soluble nitrogen, and other nutrients for rapid early growth.

Of the cereal grains, barley is most sensitive to the lime content of the soil. In Europe, where it is the principal feed grain, the lime status of the soil is given as much attention as we give it in growing legumes. In one experiment conducted for nine years at Columbia, barley on a properly limed soil produced an average increase of 4½ bushels per acre over unlimed soil. Not only is the calcium from the lime important, but the availability of other nutrients is also influenced.

Soil fertility experiments with barley have been conducted at various locations in the State for nearly 20 years. On many soils the crop has been almost a total failure where no soil treatment has been added. Following the mild winter of 1952, untreated barley at the South Farms near Columbia produced only 20 bushels per acre. Where the grain was seeded on summer-plowed land, given 250 pounds per acre of an 0-20-20 starter fertilizer, and topdressed with 40 pounds of nitrogen in the spring, the yield was 75 bushels per acre.

Although the response to fertilizer will vary with the season (the season can influence the amount made available in the soil), recent experiments show the need for ample available phosphate. In one experiment, when barley

was planted on summer-plowed land after the red clover was cut for hay, the application of 80 pounds of phosphate increased yields 20 bushels per acre over a 20-pound application. Forty pounds of potash increased the yields only 10 bushels.

Yields were increased one bushel for each two to four pounds of nitrogen applied. The greatest increase from nitrogen resulted from topdressing in March. Nevertheless, fall applications were of much benefit. Much difficulty has been encountered in making spring topdressings at the proper time, since the soil is frequently too wet to hold up spreading equipment. In many seasons, fall application of nitrogen will be superior to that obtained in spring, when the plants need a "boost" to give added fall growth, or when maximum fall and early spring pastures are desired.

For greatest return, barley should be planted on fertile, well-drained soil on the best seedbed possible. Ample phosphorus and potassium in an available form should be applied at the time of planting. Where land was summer-plowed, from 10 to 15 pounds of nitrogen should be included in the starter fertilizer with a topdressing of 30 to 40 pounds of nitrogen per acre in the fall or early spring. Where land was not plowed early, the starter fertilizer should include 25 to 30 pounds of nitrogen at time of seeding, and an additional 30 to 40 pounds as topdressing later. Good yields of barley call for a carefully fertilized soil to produce them.—*Missouri Farm News Service, September 1953.*

Dry Weather Pasture Tips

REWORK and reseed one fifth of your permanent pasture each year for high yields and insurance against dry-weather pasture headaches.

That's the advice of H. A. Cate, Extension Specialist at the University of Illinois Dixon Springs Experiment Station.

Cate says you cannot expect good production from pastures beyond about five years after they're seeded. You'll get best pasture production only as long as legumes remain in the mixture. As legumes decrease, production falls rapidly.

Reseeding one fifth of your pasture annually will mean that you'll be going into dry years with relatively new seedings, says Cate. They'll provide better stands than the old permanent pastures, as well as produce more forage with spring rains and make more rapid recovery when the fall rains begin.

The new seedings each fall will also help get you through hard winters when roughage supplies run short, by cutting a month or more off the barn feeding period. You can use winter grains seeded as a nurse crop for early spring pasture. If you don't need the grain for pasture, it'll provide a welcome cash crop.

Korean lespedeza has been a late summer and dry weather stand-by in southern Illinois pastures for years, observes Cate. However, it's only dominant in the pasture during the first year—the seedling year—and is practically nonexistent in older pastures. With new seedings going in annually, you'll have lespedeza to provide an excellent emergency crop if the season gets dry.

Finally, Cate has observed that farmers who have been hurt least by drought are the ones who follow a sound fertility program. If you reseed part of your pasture each year, you'll have a better chance to apply the necessary fertilizers for high production.

High-level Fertility

(*From page* 10)

crop yields may be obtained without its use.

Dry matter weights of roots and tops shown in Table III indicate that on treated land there were 2.85 pounds of tops for each pound of roots (1:2.85). On the untreated land there were only 1.78 pounds of tops for each pound of roots (1:1.78). Evidently the roots on the treated land carried or conveyed much more moisture and plant-food elements per pound of roots than did those on the untreated plot.

Photographs of the washed out roots (Fig. 1) indicate that on the untreated land the root growth was concentrated largely in the upper portion of the 9-inch depth of soil removed. Roots from the treated plot LPN appeared to be well-developed throughout the 9-inch layer of soil.

The pounds per acre of dry matter, nitrogen, and potassium on the treated plot LPN, gave an increase which was rather uniformly three times that of the untreated land. The exception to this was phosphorus which increased approximately five times in total pounds an acre due to the addition of 200 pounds an acre of superphosphate.

Persons of Simplicity

(*From page* 5)

enjoyment of his brief lifetime of opportunity. For simplicity is not just being surrounded with few if any of the costly or rare possessions which men admire. One can have a share of these good things of the world and yet keep faith with some inner spiritual values—the kind that help one to know and understand and sometimes to exert as a force for happiness to others.

Of course, we often forget that there is a trap set for some of us who profess to be devotees of simplicity. Quite often a person with extreme simplicity abuses it. Somehow, he gets mixed up. He cares little about knowing new things or finding out what simpler methods there may be to perform old tasks. He thinks that simplicity is an end in itself.

He hates to be forced into places where the work is hard and difficult to master. He prefers to dawdle and dream. From this misguided state he soon drifts into a static condition where he is able to contribute but little to the art of living skillfully and effectively.

Yet consider the other extremely opposite branch of this business where men of science and learning congregate, and where study and real achievement are the rule. I doubt if there be any group of persons in the modern realm who live the simple life more fruitfully and fully than your college teacher or scientist. Skillful as they are in many great arts and fields of learning, resourceful as to memory and wise and erudite beyond common degree—these people bring to their firesides and hours of gracious ease a charm and a glow which are natural and wholly unaffected.

What, then, may we believe in regard to the substance of simplicity? Is it something that one inherits, acquires from others in a community, or is it to be measured by the dollar sign? As far as our humble belief is of value, simplicity has much to do

with knowing. Not just to know the big facts of life but to know a little about a lot—especially about folks and homes and living and dying and loving as one goes along. One who has had their full stock of simplicity may have doubts of its value to them. But in due time they will find out and possibly be thankful that their natures were cast in such a mold—the better to enjoy what little time may be left to them and theirs.

Living the "simple life" is constantly getting more difficult—even for those who resist its inroads and confusions. But one need never lose the native charm of simplicity of manner and mood even when he is dependent upon countless complex machines, forces, and services.

MOST of us do not understand clearly what makes these modern miracles work, miracles that have changed the face of time and the work of the everyday world we knew to be rather simple and peaceful when we were young. Yet some of those who have studied and do know all about them and easily take things apart and put them together again properly—many of these persons behave quite naturally. They do not let the powers of science and engineering cloud their belief in the decency and dignity of man, where plain things assume grandeur and little things of this short life are inspiring.

Quite often trained professional marvel-makers pause in their deliberations and conquests to give praise and tribute to some among them who have retained a few of those fundamental human traits that revolve around simplicity and honesty and truth. Cold, hard, unsympathetic and materialistic minds seldom awake admiration enough to deserve and receive the topmost tributes from their fellow-workers.

Last week I shared a taxicab in a big city with a stranger. The cabby was rather voluble and friendly, passing warm and chummy remarks in the Italian immigrant's brand of English. Seeing that my companion was leaning a bit too hard against the cab door, the driver cautioned him not to do so in traffic. This seemed to enrage the other rider and he began to berate the cabby, saying he did not need either his advice or his constant talking.

The bewildered cabby looked at me in silent appeal, and then told the rider he was glad it was only a block to the depot, and that all he had tried to do was stop a possible accident and loss of time and injury. I lingered a moment after the abusive rider had seized his grips and piled out. There was some inner charm and warm, human kindness in that Italian-American cabby—his previous conversation only bringing them to the surface, instead of the way the other person took it.

I told the cabby not to fret about such trifles and that most folks were not that dumb and harsh in their human sensibilities. "I know that," he replied, "but I believe he is not a good man—the way he acted to me—a poor, hardworking, tired-out guy living in three rooms with a wife and four children. Good men do not act that way to anybody—but I fixed him good, I charged him 25 cents extra." I patted the fat shoulder of the weary driver and watched him steer his way across slippery, busy streets to find another waiting person somewhere who wanted a lift to somewhere else. Giving folks a lift is his steady trade and believe me, he has far more than a cab to help him make good friends.

I believe that persons of true simplicity pride themselves far more on being able to be tolerant, human, patient, and kindly than they do on most other attainments for which they may be renowned. This short life is at best a puzzle picture, but when the jigsaw bits spell out the answer we shall see simplicity of character and love of mankind assume first place in the scene.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)

The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)

The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)

The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800-ft. reel.)

Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)

Borax From Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)

Potash Production in America (Sound, running time 25 min. on 800-ft. reel.)

In the Clover (Sound, running time 25 min. on 800-ft. reel.)

In Canada: The Plant Speaks Thru Deficiency Symptoms
The Plant Speaks, Soil Tests Tell Us Why
The Plant Speaks Thru Tissue Tests
The Plant Speaks Thru Leaf Analysis
Borax From Desert to Farm
Potash Production in America

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.

Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.

Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.

Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.

West: Department of Visual Education, University of California, Berkeley 4, California.
Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.
Department of Visual Instruction, Oregon State College, Corvallis, Oregon.
Bureau of Visual Teaching, State College of Washington, Pullman, Washington.

Canada: Canadian Film Institute, 172 Wellington Street, Ottawa, Ontario.

For the Province of Ontario: Distribution Services, Ontario Agricultural College, Guelph, Ontario.

IMPORTANT

Requests should be made well in advance and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Reprints

28-12-45 Better Corn (Midwest) (Circular)
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What is the Matter with Your Soil?
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
A-1-44 What's in That Fertilizer Bag?
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—The Aristocrat
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
ZZ-11-45 First Things First in Soil Fertility
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
I-2-47 Fertilizers and Human Health
T-4-47 Fertilizer Practices for Profitable Tobacco
AA-5-47 The Potassium Content of Farm Crops
TT-11-47 How Different Plant Nutrients Influence Plant Growth
VV-11-47 Are You Pasture Conscious?
R-4-48 Needs of the Corn Crop
X-6-48 Applying Fertilizers in Solution
AA-6-48 The Chemical Composition of Agricultural Potash Salts
GG-10-48 Starved Plants Show Their Hunger
OO-11-48 The Use of Soil Sampling Tubes
SS-12-49 Fertilizing Vegetable Crops
F-1-50 A Simplified Field Test for Determining Potassium in Plant Tissue
K-3-50 Metering Dry Fertilizers and Soil Amendments into Irrigation Systems
V-5-50 Potassium Cures Cherry Curl Leaf
BB-8-50 Trends in Soil Management of Peach Orchards
I-2-51 Soil Treatment Improves Soybeans
X-8-51 Orchard Fertilization Ground and Foliage
BB-10-51 Healthy Plants Must Be Well Nourished
CC-10-51 Producing Small Grain More Efficiently
EE-10-51 Rotation Fertilization
II-12-51 Pasture Improvement With 10-10-10 Fertilizer
KK-12-51 Potassium in Animal Nutrition
A-1-52 Research Points the Way to Higher Levels of Peanut Production
D-2-52 Boron for Forage Crops
E-2-52 Ladino Clover—Its Mineral Requirements & Chemical Composition
H-3-52 The Relative Merits of Inorganic & Organic Sources of Plant Nutrients
L-4-52 Efficient Use of Fertilizer in the Southern Region
O-4-52 Tomato Production for the Canning Industry
Q-5-52 Potassium-nitrogen Balance for High Corn Yields
R-5-52 Why Plants Differ in Fertilizer Need and Mineral Composition
V-8-52 Growing Better Turnips
X-10-52 The Mineral Uptake by the Sweet Potato
Y-10-52 The Nutrition of Muck Crops
CC-12-52 The Leaf Analysis Approach to Crop Nutrition
DD-12-52 Potash Deficiency of Reforested Pine and Spruce Stands in Northern New York
EE-12-52 Flue-cured Tobacco Fertilizers of the Future
A-1-53 Phosphate and Potash Effects on Ladino Clover Swards
B-1-53 Commercial Fertilizer Is a Sound Investment
F-2-53 Grasses and Weeds—The Potash Robbers
I-2-53 Sericea Is a Good Drought Crop
J-3-53 Balanced Nutrition Improves Winter Wheat Root Survival
K-3-53 Kudzu Keeps Growing During Droughts
M-3-53 Soil Testing in New Jersey
N-4-53 Coastal Bermuda—A Triple-threat Grass on the Cattleman's Team
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THE AMERICAN POTASH INSTITUTE

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A city slicker, passing through the mountains, decided he'd like some of the moonshine he'd heard so much about. He finally located a native known to mix an occasional batch.

"Got two kinds," the moonshiner said. "Which one you want?"

"Two kinds?" the man asked. "What do you mean?"

"Well," drawled the native softly, "it's all accordin' to what yew want it fer—courtin' or fightin'!"

* * *

"Jim, I don't think our daughter's old enough to wear a strapless gown to the high school prom, do you?"

Father buried in the newspaper: "If the thing stays up, then she's old enough."

* * *

Colonel, examining officer candidate: "Name five outstanding military leaders."

Candidate: "Eisenhower, Napoleon, Grant, Patton, and—excuse me, Sir, but what did you say your name is?"

* * *

Girl: "Must you drive with one hand?"

Gob: "Sure, the car won't steer itself."

* * *

A first grade teacher read her pupils some nursery rhymes. To find if they had paid attention, she asked them questions about the rhymes.

"Why did the cow jump over the moon?" she inquired.

Little Johnny spoke up: "Probably because the milkmaid had cold fingers."

A funeral parlor wired a man informing him that his mother-in-law had died and asked whether he wanted her buried, embalmed or cremated. The answering reply was: "All three; take no chances."

* * *

Private Jones, an inveterate and successful gambler, was such a demoralizing influence in his unit that his lieutenant, after trying unsuccessfully to reform him, sent him before the captain. After the interview the lieutenant was summoned.

"I've shown Private Jones he can lose a bet," the captain said. "I asked him why he couldn't stop betting, and he said: 'Sir, it's a habit I can't seem to lose. Why, I'll bet you a dollar right now you have a mole on your left shoulder.' Well, I knew darn well I hadn't, so I took off my shirt and showed him. He admitted he had lost and paid the dollar. I guess that'll hold him!"

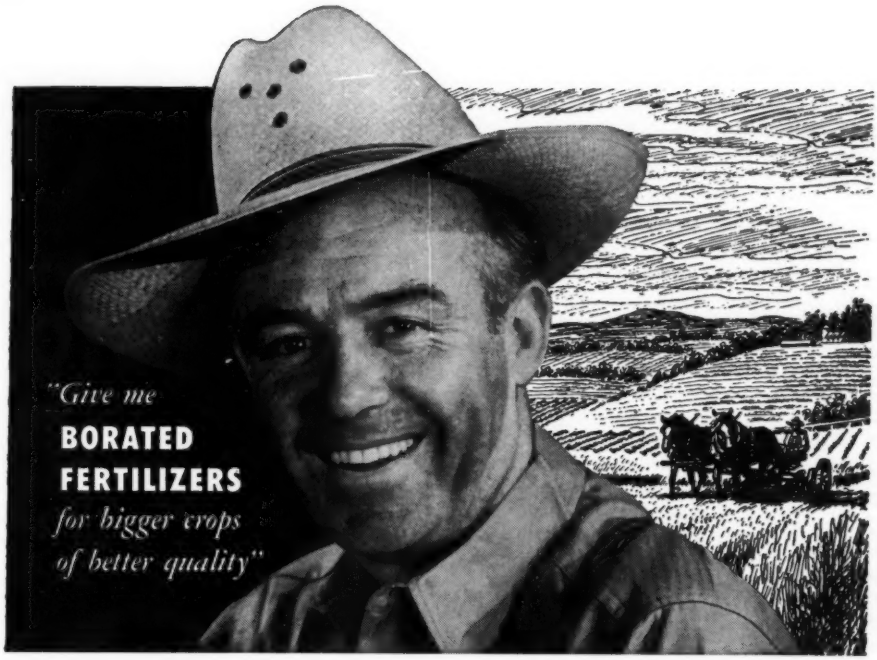
The lieutenant was so noticeably silent that the captain asked: "What's the matter? Aren't you pleased?"

"No, sir," was the reply. "You see, on the way to your quarters Jones bet me $5 he'd have the shirt off your back in five minutes."

* * *

A cruising police car received the following call: "Calling Car 13. Go to Main at Pine Street. Nude woman running down the street. That is all."

There was a pause. Then came an afterthought: "All other cars stay on your beats. That is all."



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FERTILIZER BORATE (*equivalent to approximately 93% Borax*) and FERTILIZER BORATE-HIGH GRADE (*equivalent to approximately 121% Borax*) come in fine mesh for addition to mixed fertilizer, or coarse mesh for direct application where required. This material saves you important money in cost of transportation, storage and handling, etc., because water content is held to approximately 24% water (5 mols). County Agents or State Experimental Stations should be consulted for detailed recommendations. Write today for literature!

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